AMERICAN SHIPPING PROGRAMME. See p. 326.
ACOUSTIC EFFICIENCY OF FOG-SIGNAL MACHINERY. See p. 318.

SHIPBUILDING AND SHIPPING RECORD

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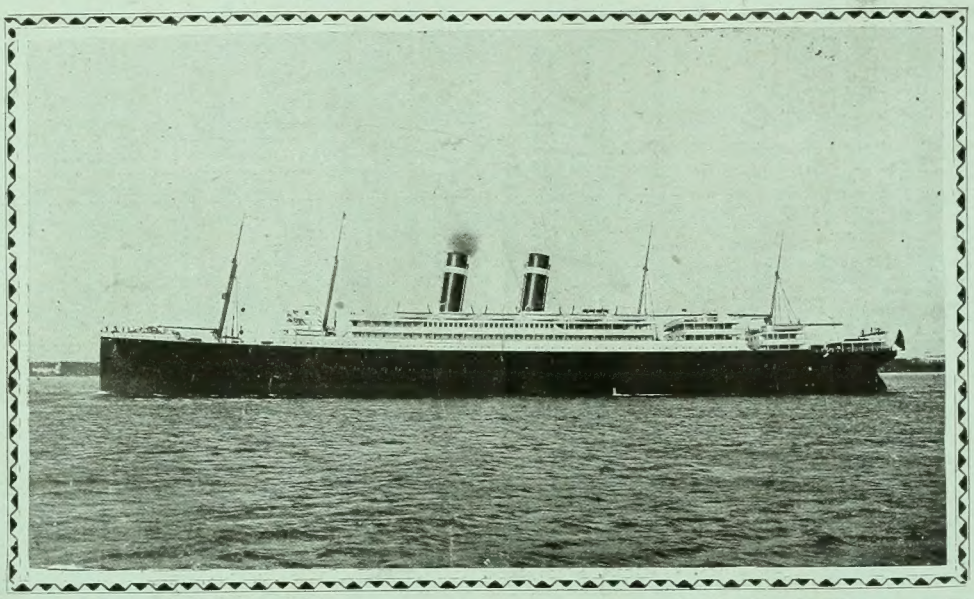

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THE Committee of Lloyd's Register of Shipping have, during the last three months, approved plans for the construction of a number of vessels built of ferro-concrete with a view to classification in Lloyd's Register Book, and one of the society's principal surveyors has recently made a tour of inspection in Scandinavia, where the use of the ferro-concrete system of ship construction has so far been most developed. It may therefore be reasonably assumed that rules for the construction of vessels with this material will soon be drawn up for the guidance of builders in this country. Already such official rules have been issued in Denmark, although so far these only apply to the building of small flat-bottomed vessels built of ferro-concrete. The dimensions are to be fixed on the basis of the Union of Danish Engineers' rules for structural work in ferro-concrete, and we note that the bottom and the sides must be at least 2·8 in. thick, whilst surfaces less than 3·2 in. thick are to be considered as simply supported unless so reinforced as to be capable of withstanding bending moments in both directions. The tensile stress on the metal must not exceed 8 tons per sq. in. and the compressive stress on the concrete 800 lb. per sq. in., which gives a factor of safety of 7. When the calculated shear stress on the concrete exceeds one-tenth of the compressive stress, provision must be made for taking it wholly on the metal reinforcement. Watertight partitions are required to withstand water pressure from either side full up to the deck level, and safety against local collision is to be provided by giving the vessel such a shape that under normal conditions it can only be hit above the water line.

Rules for Ferro-Concrete Vessels.

An underwriter is presumed to be acquainted with the usage and customs of the trades which he insures, and it is unnecessary for the assured to disclose any facts as to that custom and usage. Thus, at ports where transhipment into craft is usual, it is not necessary for the underwriter to be informed of the fact, since he is presumed to know it already. This ruling has acted excellently in the past, and it is seldom that any controversy has arisen over such matters. The present times, however, find vessels in strange places on occasions, and customs, where they exist, have sometimes to give way to the necessities of war conditions. How, then, can the underwriter be presumed to know that which is neither customary nor usual? It would seem that here is a hard case for the insurer, and one which expert knowledge of the details of sea-borne trade will in no wise assist. To the goodwill of the assured must be added the good sense of those responsible, whoever they may be, and owners can be trusted to instruct their agents to act with all precaution, so that not only may their interests be protected, but also those of the underwriters.

The Usage and Custom of the Trade.

For some time past rumour has been busy foretelling some change of policy on the part of the Government War Risk Insurance Office. From time to time various alterations have been made, such as the extension of the limit of the value on which steamers may be insured, the inclusion of vessels belonging to Allied nations, and such like changes which are now familiar to all concerned. The rumours which have been prevalent recently have dealt with quite another aspect of the case, however, and amongst the boldest of the several forecasts which have been current has been that which prophesied an entire monopoly of war risk insurance on British vessels, and those of our Allies by the Government. The secrecy, which was presumably necessary, with which the actual state of affairs was surrounded, has now been lifted, and it appears that what is actually about to take place is the abolition of the flat rates on which the Government have been accepting these risks up to the present. To this end, underwriters have been in collaboration with the Authorities through their official channels, and it is understood that the insurance market in general is willing to lend its experience to the Government in arranging a scheme which will at the same time afford a more equable arrangement of the rates for owners, and enable the administration of the Government War Insurance scheme to be carried out with dispatch and accuracy through the medium of the highly-organised bodies which are the controlling centres of marine underwriting.

The Government and War Risks.

It occasionally happens that a vessel insured on a free of particular average basis receives injury concerning which there is doubt as to the actual manner in which it was caused. This fact assumes importance when it is considered that claims do not attach to policies on a "free of particular average" basis unless the vessel be stranded, burnt, &c., the details of the exceptions being fully stated in the clause. The most common point which may be raised in this connection is that of stranding, and it is well that a clear understanding should be acquired as to what constitutes a stranding. Broadly put, a vessel is deemed to have stranded when she takes the ground for such a length of time as to interrupt the voyage, but to this statement there are many exceptions, for instance a vessel striking a rock and remaining on her beam ends for some 90 seconds was held not to have stranded, since there was no settlement of the vessel for a sufficient length of time. In these days, when the striking of a submerged object is of frequent occurrence, casualties of this nature assume considerable importance. Masters should be instructed to take proper note of the duration of any stoppage and the manner in which the vessel behaves, since upon reports of this nature the decision of whether a claim attaches

Stranding.

to a free of particular average policy or not will be made. Of course, this applies to the "free of particular average" insurance only, the "free of particular average absolutely" clause excluding all damage except general average sacrifices.

Fairplay for British Shipping.

Since Herr Heineken expressed the opinion that British shipowners would have to work with German shipowners after the war "whether they liked it or not" much has happened which can hardly be said to confirm his forecast. The development which the head of the Norddeutscher Lloyd is certain to like least is the hardening of opinion in the United Kingdom on this very question of the post-war relations of British and Austro-German shipping. Our shipowners are more than ever determined to beat the Germans in the war after the war, and they have not the least doubt that, given a fair field by their own Government, they will be able to do so. Anybody who doubts their ability to do so has only to remember that the pre-eminence of the British Mercantile Marine is due to their unaided enterprise. No Government has ever done anything to help them, and some Governments have even gone to the length of putting obstacles in their way. When we say that if they get a fair field they will effectively dispose of Herr Heineken and his friends, we do not mean that they ought to be given subsidies, but the great majority of them think—and we agree with them—that where a German or an Austro-Hungarian ship enjoys State aid, given directly or indirectly, the effect of British law should be immediately to neutralise the economic advantage. Admittedly, that does not, in the opinion of some people, go nearly far enough. In the end, it will probably be found to be less than the British Government actually does. But the point which we desire to make for the benefit of Herr Heineken and those who think like him, is that if the State does no more than is indicated, the future of German shipping will leave much to be desired.

World Tonnage Shortage.

The shortage of merchant tonnage which exists at the present time has led to the utilisation of many vessels for cargo carrying that were originally built for other purposes. Thus many yachts are being transformed into profitable trading vessels. Amongst these we may mention the *Valhalla*, once the property of the Earl of Crawford, and also Mr. Albert Brassey's *Czarina*, which are now employed in business instead of in pleasure, and it is said that the ex-Empress Eugénie's *Thistle* was also acquired for mercantile work. Several well-known steam yachts have also been pressed into service, the latest being the royal yacht of Siam which has just been bought by a Japanese company for the Australian trade and renamed the *Taiko Maru*, whilst an interesting instance of the value of these ships when converted is the iron steam yacht *Dotterel* of 214 tons y.m., built in 1887, and which was sold last May for £3,900. She was converted into a cargo boat and, it is stated, resold for a little under £10,000. The world shortage of tonnage has also led to the pressing into service of many vessels that had previously been considered as unfitted for further work. Thus many sailing vessels of ancient rig are being overhauled and converted into ocean carriers, as an instance of which we may quote the whaling barque *Andrew Hicks*, which was built at Fairhaven in 1867. The vessel has recently been sold to foreign account and will be placed in the overseas trade, carrying cargoes which in ordinary times would be handled by steamers.

The Italian Outlook.

It is very evident that the Italian shipping interests are preparing to make the most of the maritime situation when the war comes to an end, and, according to all accounts, they are receiving every encouragement from the Government, which has now issued a decree prohibiting during the period of the war, and for a year after the conclusion of peace, the sale or transfer of vessels on the national register to foreigners. At the same time, foreigners or foreign companies cannot become owners or joint-owners of Italian ships, which must be entirely controlled by Italian subjects. The strong combination of liner companies recently effected is another development which is also of considerable significance in this connection, and, perhaps, especially as regards the North and South American trades. Shipbuilding, too, is apparently making good progress, and one well-known firm, G. Ansaldo & Co., of Genoa, are, we hear, doubling their capital from £2,000,000 to £4,000,000, and, in addition, are creating a large debenture issue. Other concerns are taking similar action, if on a smaller scale. New shipyards are to be free from taxation for 10 years, and workers in them, as well as in existing establishments, are not to be called up for military service. Another measure for the expansion of the national mercantile marine which has been adopted by Italy, and which has been advocated here, so far without result, is the exemption of war profits from the super-tax if they are employed in the purchase of ships abroad, or in the construction of them at home. We are glad to add that, contrary to what was the case not very long ago, there are no Italian vessels capable of service now lying idle; every ton is being used for the benefit of Italy or her Allies.

Shipping Space Control.

Although in consequence of the shortage in tonnage it has been necessary to restrict both exports and imports, there is a general opinion in commercial quarters, we hear, that the facilities for shipment have on the whole been wonderfully good. In particular, so far as the Dominions are concerned, special care has been taken to provide for the urgent necessities of the different business communities, and as the result of a careful and detailed investigation information was obtained which enabled the various Controllers to indicate the degree of priority that should be given to the various requirements specified. The Government of the Union of South Africa has, moreover, adopted measures which, in the case of goods from North America, will prevent the large firms from securing an advantage at the expense of the small concerns, which they could, for instance, ensure by chartering neutral tonnage. This, however, is no longer possible. Now, we understand, the United States Government has taken action in the matter, with the result that in future export licences will be necessary for a large number of articles. The primary object is to prevent the shipment of commodities which are wanted by the American people, but the intention is also to put an embargo upon supplies to the enemy through neutral sources. It is planned first to determine the quantities of grain, coal, sugar, oil, &c., that the country can spare, then to assess the needs of the Allied nations, and, finally, to distribute the surplus amongst the neutrals, those non-contiguous to Germany, Austria, and Turkey being given the preference. In the circumstances, it is scarcely possible to avoid mistakes—in our own case they have already happened—but it is at least satisfactory to learn that the best is being made of an unusually difficult and complicated situation.

The Aims of Labour.

While it would be foolish to deny that organised labour is, in these stirring times, inclined to force matters in rather uncompromising fashion, it can hardly be called wise to take its actions, or threats of actions, at their face value. To talk of a "ferment of revolution" is to help rather than to hinder the "aggressives," for it gives them and their propaganda an exaggerated importance. There are two little truths which may profitably be remembered by level-headed people. One is that when industrial conditions are as they are at present (apart from their abnormality. the more advanced trade unionists are always most in evidence. The position is determined by what is called the state of the Labour market. In other words, the extremists are in evidence most when employment is plentiful and least when it is scarce. As readers

are aware, it is unprecedentedly plentiful just now; therefore, the "ferment of revolution" seems to be unusually active. The other little truth which ought to be remembered is that the movement, which is in some quarters regarded as singularly disquieting, is a rank and file movement, working for the most part in defiance of constitutional Trade Unionism. The significance of that does not appear to be appreciated by the general public. It is, nevertheless, of some importance that it should be. If the rank and file movement were the powerful affair it is claimed by some, and feared by others to be, it would have no need to act unconstitutionally; it would be able to remould constitutions and to make its aims and policy those of official Trade Unionism. The reason why it does not do so must be, of course, that a majority of the workers do not subscribe to its objects.

British Shipbuilding Practice.

In its preliminary report the Metallurgical Section of the Iron and Steel Institute's Committee which is investigating British production methods, and comparing them with American and German practice, supplies some figures of labour costs which cannot fail to give thoughtful employers pause. Our more expert steel workers actually do far less, and get much more, than their fellows in either of the two foreign countries named. The whole report, as well as that of the Mechanical Section of the Committee, ought to be carefully studied by employers belonging to every industry. It occurs to us to add that the Shipbuilding Employers' Federation, and also the Engineering Employers' Federation, might very profitably conduct investigations on similar lines. It may be that British general engineering is in less need of research of this character than any other industry, although we are sceptical about it. There is, however, no doubt about the case of British shipbuilding. In many respects its production methods were, prior to 1914, far behind those of one or two foreign countries in efficiency, and the signs are that they will be still further behind when the war comes to an end. As the majority of our readers know what the deficiencies are we do not enumerate them. For the same reason we assume it to be unnecessary to indicate their causes. To date, however, they have not been investigated in the judicial way the Iron and Steel Institute's Committees are investigating their trades deficiencies, and it is time, we frankly think, that they were.

Subdivision of Cargo Ships.

Some misapprehension appears to exist even amongst those who ought to know better, regarding the Bulkhead Committee's attitude towards the subdivision of purely cargo ships. Thus, in one of our contemporaries, an article appeared a fortnight ago, on "Unsinkable Ships," signed by "A Naval Architect," which contained the following:—"The recommendations made two or three years ago by the Bulkhead Committee . . . *produced a ship that would not sink above a certain margin of safety line after three compartments were in free communication with the sea.*" Further on, he says: "*We have every right to be hopeful of the future, as all our standard ships are presumably, at least, equal to those requirements.*" If our standard ships were three-compartment ships, as this writer suggests, then all would be well, but, in the first place, his ideas of the findings of the Bulkhead Committee are infantile, and, in the second, the standard ships are very much like other cargo ships in the matter of subdivision. The Bulkhead Committee, in their second report, recommended that the bulkheads of cargo ships "should so be spaced as to secure the greatest possible measure of safety *consistent with the requirements of the service in which the vessel is to be engaged.*" This leaves the disposition of bulkheads in cargo ships exactly as before, viz., placed so as to meet the requirements of owners and of the registration societies, with no compulsory measures as regards safety. It would be better if less attention were meantime being given to the requirements of trade, and more to the endeavour to keep ships afloat, which latter could be well achieved by such subdivision as has recently been advocated by Mr. John McLaren.

Turbine Casings.

It is recognised amongst marine engineers that the successful introduction of reduction gearing of the mechanical type will quickly lead to the abolition of the slow-speed turbine direct coupled to the propeller shaft, and, consequently, to the development of the high-speed turbine. This means that the turbines will be much shorter in length, owing to the fewer number of stages required, there being a greater fall of pressure per stage in the high-speed turbine than in the slow speed. But fall of pressure is accompanied by a corresponding fall of temperature, and hence the turbine casings and rotors will be subjected to greater differences of temperature than hitherto. Especially will this be the case when superheated steam is employed in conjunction with an impulse wheel at the high-pressure end, the relatively large fall of pressure in the nozzle being accompanied by a correspondingly large drop of temperature. It is well known that cast iron is unable to withstand the effects of high and variable temperatures owing to the "growth" and the distortion which occurs setting up stresses beyond the safe limit for the material. Hence it is now becoming the usual practice to construct the high-pressure end of the casings of cast steel and the low pressure end of cast iron, cast steel being in every respect much stronger than cast iron. The rotors, of course, are always of cast steel, due to the extra centrifugal stresses they are called upon to bear. An example of this type of turbine casing is to be found on the *Aurania*, the machinery of which was described in our issue of August 23, p. 177, and in which the steam admission ends of both high-pressure ahead and high-pressure astern turbine casings are made of cast steel.

Crews' Accommodation.

Within the past year or two there has been a decided tendency towards providing better accommodation and a reasonable degree of privacy to the crews of sea-going vessels of every type. This is a step in the right direction, for it is due to seamen and firemen alike that their life on board ship should be made as bearable as possible. In the standard ships this feature has received every consideration, and separate two-berth rooms are provided for the accommodation of the crew. The lavatories, bath rooms and closets are well appointed, and close at hand. The junior officers and engineers are also provided for, in a way hitherto uncommon, each having a separate room under the bridge deck. The housing of the crew under the poop is also an improvement in comparison with that under the forecastle deck. Better ventilation should be secured, and the annoyance of the continued pounding of the seas on the ship's sides will be obviated. Of course, the position now favoured is not free from objection, but much preferable to that formerly given to crews' quarters. The providing of a small smoking-room for the crew is another of the evidences of the efforts of the authorities to afford some degree of comfort to them. Previous experiments made by several shipowners in the same direction have met with varying success. In some cases, rather than appreciating the efforts being made for their comfort, the crews have interpreted them as a certain "softness" on the part of the owners, and have become more discontented than ever. It is to be hoped that in spite of such experiences, there will be no retrograde movement towards the "glory holes" of the past.

Fog Signal Machinery.

The events of the last three years have tended to draw the attention away from those perils which always attend the journeyings of ships to the more immediate perils resulting from the state of war, and experiments which have for their object the increased safety of ships at sea have either been stopped altogether or deflected to devising ways and means of overcoming the peril of mine and torpedo. It may, however, be reasonably

expected that soon after the conclusion of hostilities the work of increasing the protection of ships from the peril of collision with rocks or other ships will be taken up again with a view to increasing the efficiency of the signalling machinery itself, and the means adopted on board a ship for detecting the warning. The problem is thus two-fold. The first part—that of designing a suitable sound signalling apparatus—is dealt with in a paper recently read before the Franklin Institute by Louis Vessot King, M.A., D.Sc., F.R.S.C., for an abstract of which see page 318, from which it appears that the diaphone is the most efficient type of marine fog signal yet devised. The second part of the problem—that of devising means of locating these signals from the bridge of a vessel—is one which is deserving of a great deal more attention than it has hitherto received. The instrument for detecting fog signals, called the phonometer, should be developed so that it becomes possible for the officer on watch to tell approximately both the direction and the distance of the vessel from the point from which the signal emanates. A phonometer fitted to every large vessel would materially lessen the risks of collision during foggy weather.

AMERICA AND SHIPS.

THE announcement from New York that the names of erstwhile popular German liners, which were seized, have been changed indicates another step in the direction of the war by our latest ally. Coming as it does on the notification of a big shipbuilding programme, some details of which we publish on page 326, the action of stripping liners like the *Vaterland* and the *Friedrich der Grosse* of their Teutonic associations is characteristically American in its thoroughness.

That America intends to pull her whole weight is apparent from the shipbuilding programme. Mr. W. J. Bryan said the other day when addressing a gathering of 1,000 public lecturers on the war "the quickest way out is straight through." As an earnest of this the Emergency Fleet Corporation has contracted for 40 standard ships of 9,000 tons d.w. for about £261,000 each. This at £29 a ton, although not a high price as tonnage is rated nowadays, is a striking commentary on the rising cost of ships compared with pre-war figures. The Shipping Board estimates that the commandeered ships will absorb an outlay of £103,000,000. The building programme involves £57,000,000 for 433 ships of about 2,000,000 tons, 452 ships aggregating 3,000,000 tons and costing £91,000,000, and 237 ships of about 1,280,000 tons under negotiation for which something like £38,800,000 is to be set aside. In addition to this about 150 miscellaneous vessels of 1,800,000 tons will be required at an estimated cost of £60,000.

There is said to be three-quarters of a million tons of neutral shipping under detention in whose holds over 100,000 tons of grain or other foodstuffs is said to be rotting. Measures are being taken to overcome the anomaly of holding up ships when the tonnage question is so acute.

The official estimate is that by the end of 1918 more than 1,600 ships, totalling some 9,200,000 tons, will be added to America's merchant fleet, 2,500,000 tons of which is under construction or on order, mainly, we believe, on behalf of ourselves and France. The difficulty that has arisen between the American Shipping Board and the interested parties in Great Britain and France is one which will no doubt be settled amicably and, we trust, equitably. The position at the moment seems to be that the Shipping Board, backed up by a considerable amount of public sympathy and approval, seek to retain the ships, not only "for the duration," but absolutely and finally. This is part of a policy initiated before the war, but accentuated in the earlier stages; it is the policy of building up and strengthening the position of America's mercantile marine. One of the first war measures was the passing in the latter part of 1914 of an Act to permit the registration in America of vessels built outside the States. This in the early stages resulted in a considerable influx of foreign-built ships, the rate being only stemmed by the action of the countries concerned in prohibiting or, at any rate, limiting the sale or transfer of ships flying their respective flags.

America's action in thus vigorously augmenting her merchant fleet is fraught with great possibilities, the bounds of which cannot be foreseen. It may possibly rehabilitate America's position, lost during the Civil War, as a potent factor in the control and direction of overseas shipping. It must, in any event, be regarded as shortening the interval during which tonnage will be scarce. The accelerated shipbuilding will ensure this. As regards the future, in a period of such kaleidoscopic changes, conjecture becomes instable speculation. It is not difficult, however, to foresee the eclipse of Germany by America as an overseas carrier.

THE BOARD OF TRADE AND THE SUBDIVISION REQUIREMENTS.

SHIPBUILDERS generally are anything but satisfied with the methods adopted by the Board of Trade in putting the Bulkhead Committee's recommendations into practice. There is evidence in the latter's report of a broad-minded view of the question of safety; on the other hand, some aspects of their work show an adherence to an excessive degree of accuracy which affords the Board of Trade the necessary excuse for repeating the offence.

The adoption of the standard permeabilities is the evidence of the Committee's broad-minded outlook on the problem, the submitting of the preliminary calculations involved in the forms BH_2, BH_3, and BH_4 in the "Instructions Relating to the Construction of Passenger Steamships," issued by the Board of Trade, is the evidence of the Board's lack of sense of true proportion. The Board of Trade may argue that they are following to the letter the recommendations of the Bulkhead Committee and that any blame that shipowners are anxious to shower on them should be passed on to the Committee. This is to some extent admitted, but it is up to them to find a means of applying the regulations in a reasonable way.

The Bulkhead Committee are not blameless. There is evidence of the work of two distinct parties in their report. In the first place they adopt a mean permeability of 60 per cent. for all cargo spaces—but this permeability may vary from 40 per cent. up to 70 or 80 according to the nature of the cargo carried. On the other hand, their scientific staff spent a long time in elaborating a method of correcting all ships for form—which correction is proving the stumbling block of shipbuilders at the present time—and which alters the positions of bulkheads generally only to a slight degree.

With regard to the adoption of the standard permeability of 60 per cent. it is the opinion of many that some trades are being severely handicapped thereby. Permeability of various cargoes should be tested by full scale experiments, because the behaviour of water in a ship's hold full of bags of flour, for example, would be very different from small scale experiments. The "time element" in permeabilities has never been thought of, yet it is a very vital one. Take the cargo mentioned. Water will fill round the bags of flour and perhaps wet the inside of the bags, but it would take days to permeate right to the centres. So that the theoretical permeability of flour is by no means the actual, and a vessel laden with such a cargo would be quite safe with a greater floodable length than that obtained at present from the curves. The permeability, instead of being 60 per cent., would probably not exceed 30 per cent. for

at least 24 hours, and would slowly increase after that, but so slowly that days might elapse before the ship sunk another foot.

Mr. Lovett, at this year's meeting of the Institution of Naval Architects, suggested that drafts should be assigned according to the nature of the cargoes. If an average permeability of 60 per cent. must be assumed in order to get all vessels to the same basis, then a modification in freeboard should be allowed according to the known permeability of the cargo carried on each voyage. This is a reasonable proposition, the only objection possible being the practical working out of the scheme. The influence of permeability, however, is of paramount importance and has much greater effect on the floodable length than any of the other factors in the problem. In spite of its importance a broad average value is taken, whilst particulars of form—a relatively minor factor—are investigated closely.

It is admitted that the actual floodable length of a vessel is dependent to some degree on the form apart from dimensions and fullness, and that it was necessary for the Bulkhead Committee to investigate how departure from the standard form affected floodable length and therefore position of bulkheads. When it was found that, comparatively speaking, departure from the standard had little effect on the result, it would have been a wise step to have discarded this correction altogether. The minor effect of the form correction has been well illustrated in Mr. Lovett's paper read at this year's meetings of the Institution of Naval Architects.

Further, in a paper on "The Watertight Subdivision of Ships," read before the Institution of Naval Architects in 1915, Professor Welch said, "It may be mentioned that the particular form adopted as the standard generally gives a minimum floodable length, variations from the standard being usually accompanied by an increase in such length. *Thus, if an arrangement of bulkheads is based upon the floodable length curve obtained directly from the cross-curves it will generally not need modification after taking account of difference of form.*"

In view of the above it would be wise of the Board of Trade to drop out the form correction from their tables altogether. In the preliminary stages of design shipbuilders have no time to get out all the necessary coefficients used in the method of correction. It is essential, of course, that the bulkheads should be properly spaced at the beginning, therefore as much care should be taken in the first calculations submitted as would be when the vessel was further on in the course of construction. The amount of labour involved is, however, out of proportion to the effect of these coefficients on the ultimate result, and accordingly should be dropped altogether.

The fixing of the margin line is another point on which the Board of Trade have shown a liking for ridiculous accuracy. This line is taken at 3 ins. below the upper surface of the bulkhead deck. This has been interpreted by them as the "mean" upper surface, and requires some calculation. Thus if deck plating is $\frac{3}{4}$ in. amidships and only $\frac{1}{2}$ in. at ends, the upper surface must be determined by taking the area covered by $\frac{3}{4}$ in. plating and the area covered by $\frac{1}{2}$ in. plating and finding the mean thickness. Surely the margin line could be fixed by the midship thickness.

Another matter which affords a good deal of work and which might be done with sufficient accuracy by more approximate methods, is the calculation of the permeabilities of the ends. At present this necessitates calculations of capacities of holds, 'tween decks, and tanks, and might be obviated if the multiples of lengths of holds by depth (which can be measured direct from the profile) be taken at their respective permeability values. It has been found that the mean permeability obtained thus differs only very slightly from that given by more elaborate methods.

Experience has shown that some more simple and direct manner of arriving at the positions of bulkheads to afford the requisite degree of safety is required, and the Board of Trade should take immediate steps to meet the demands of shipbuilders in this respect.

THE PRACTICAL DIESEL CYCLE.

SUFFICIENT experience has been obtained with the Diesel engine to enable us to judge with a fair degree of certainty, what can be reasonably expected from this type of engine. The superiority in the thermal efficiency of the Diesel engine is undoubted, and the problems which have faced designers in recent years have been concerned, with one exception, with the perfecting of the mechanical details of the engine. This has led to the development of a large number of successful designs, all of which may be classified under two headings, viz., the four-stroke Diesel engine and the two-stroke. Considerable differences of opinion exist as to the relative advantages of the two types, and the problem to which we referred above as facing designers at the present time, is that of deciding which of these two types is the most suitable for ship propulsion. A brief summary of the cycle of operations in each type may be of value in assisting towards a decision upon this much-debated question.

In the four-stroke engine, the first stroke of the cycle may be regarded as the upward one, in which the pure air contained in the cylinder at atmospheric pressure is compressed to a pressure of about 500 lb. per sq. in. As a result of this compression, the temperature of the air becomes so high that the fuel, when sprayed into the cylinder at the end of the compression stroke, is automatically ignited. The pumping in of the fuel is carried on for about one-tenth of the second stroke, and the expansion of the burnt gases completes the stroke. This stroke is obviously the working stroke of the cycle. On the return stroke, the exhaust valve is opened and the burnt gases are thrust out of the cylinder by the upward motion of the piston, save for the very small amount which remains in the clearance volume when the piston is at the top of its stroke. The exhaust valve is then closed, the air valve is opened, and the piston on its downward stroke sucks into the cylinder a charge of pure air. This is the fourth stroke. At the end of the suction stroke the admission valve is closed, and the piston returns compressing the air as previously described, and the cycle of operations is repeated.

The process adopted in the two-stroke engine is exactly the same as in the four-stroke, except that by the provision of exhaust ports at the bottom of the cylinder and by means of a "scavenging" pump, the exhaust stroke and the suction stroke are eliminated, and thus the whole cycle is completed in two piston strokes instead of four. Imagine the cylinder to be full of pure air with the piston at the bottom of its stroke; the upward movement of the piston compresses the air again to about 500 lb. per sq. in., fuel is injected, which automatically ignites as a result of the high temperature of the air, and the piston is driven forward. After about one-tenth of the working stroke, the fuel valve is shut and the burnt gases expand, driving the piston forward until just before the end of the stroke is reached, the exhaust ports are uncovered and the burnt gases pass away to the silencer, and thence to the atmosphere, leaving the cylinder full of burnt gas at a pressure only a little above that of the atmosphere. It is, however, necessary to fill the cylinder with pure air ready for the return stroke, hence a supply of air is led into the cylinder through the air valve from a pump, the working pressure of which is about 4 lb. per sq. in. above atmospheric. The incoming air drives the burnt gases before it, sweeping them out of the cylinder, so that by the time the piston has just covered the exhaust ports on its upward stroke the cylinder is filled with pure air at about 4 lb. per sq. in. pressure. This is subsequently compressed and the cycle of operations repeated.

The mechanical differences between the two types of engine are

therefore, broadly speaking, two; in the first place no exhaust valve or exhaust valve mechanism is required on the two-stroke engine, but more than counterbalancing this, it is necessary to fit a low-pressure air pump called a scavenging pump, on account of the fact that it cleans the cylinder, driving out burnt gases and substituting pure air. It is thus found that the efficiency of the four-stroke engine is from 5 to 10 per cent. greater than the two-stroke engine owing to the power required in the latter to drive the scavenging pump. The two-stroke engine, however, has the great advantage that it has a working stroke every revolution as against a working stroke every two revolutions in the four-stroke engine, and as a result, the weight of the former is at least from 25 to 30 per cent. less for the same power, the floor space occupied being about the same.

Such are the distinctive features of the two types, and in view of its reliability and low cost of running, the four-stroke engine has found more favour amongst designers than the two-stroke. But there are many who, on account of its saving in weight, its more even running and its simpler valve arrangement favour the two-stroke engine, and these engines have been built in not inconsiderable numbers. What is needed is a set of exhaustive comparative trials under actual working conditions and spread over a long period, so that a decision as to the better of the two types may be made once and for all.

PUBLICATIONS RECEIVED.

[*A short notice of any publication does not necessarily preclude the subsequent appearance of a longer review.*]

Practical Marine Engineering. For Marine Engineers and Students. By Captain C. W. Dyson, U.S.N., New York: Marine Engineering, 461, 8th Avenue. London: 6 & 8, Bouverie Street, E.C. $9\frac{1}{4}$ in. × $6\frac{1}{2}$ in. × $1\frac{3}{4}$ in. 982 pages + 471 diagrams. Fourth Edition. Price $6.00, net.

Whilst there are books dealing with separate branches of the great industry known as "Marine Engineering," to completely cover the whole ground it would be necessary to possess a library containing many volumes; this is necessarily an expensive procedure, and even when such a library is available, it is a matter of great difficulty to be able to obtain just that item of knowledge one is seeking at the moment. Many engineers have felt the need for a single compact volume which will cover every branch of their profession and cover it in such a way that they may obtain from its pages not only a brief summary of the principles underlying the construction and operation of any detail met with in marine engineering practice, but also a statement of the advantages and the disadvantages attaching to the employment of that particular type of detail, together with a similar treatment of alternative types so that he may be better able to form a sound judgment based upon the latest scientific principles with regard to any machinery with which he is dealing.

This book may justly be said to satisfy such a need. It is difficult to find a single branch of marine engineering that is not dealt with in its pages, and dealt with by such an even combination of theory and practice, that the engineer can obtain that balance of knowledge which is requisite for a complete understanding of his subject.

The third edition consisted of three separate and distinct parts, but in the new edition these parts have been brought together to form one connected book of fifteen chapters, and at the same time an attempt has been made to bring the whole of the material up to date. The author confesses, however, that the advance in marine engineering is so rapid that it is often impossible to do this, and when one considers the changes that have taken place in the practical application of steam turbines to marine work, for instance, the truth of the author's assertion is apparent. This objection, however, applies to most technical books.

The first two chapters are devoted to a consideration of the properties—both physical and chemical—of the materials used by the engineer, the first dealing with the materials used in engineering construction, and the second with fuels, both coal and oil fuel being considered. These are followed by a chapter on boilers, in which both the fire tube and the water tube types are illustrated and described, the chapter concluding with a description of boiler fittings. A brief chapter follows on the subject of oil fuel burning, the various systems being described and the methods of operating with an oil-fired boiler being given.

The two succeeding chapters deal with the main engines, the first one being devoted to a description of the various types of engine in use, including the various forms of turbine with all the known types of reduction gearing, and the Diesel engine; whilst the second one is devoted to a description of the principal parts of each of these types of marine engine. Auxiliaries are next considered in a very able manner, and then follows a chapter on valve gears which, in view of the fact that the reciprocating engine has previously only received but scant treatment, and also because the Stephenson gear is almost exclusively used on engines of this type, might well have been omitted or considerably reduced and incorporated in a previous chapter.

Refrigeration is the subject of the next chapter, the general principles underlying all refrigerating machinery being followed by a description of the various types of machine in use at the present time. Electricity on shipboard is next considered in its application to illumination and to the numerous details where small motors can be employed, the question of the electric reduction gear having been dealt with in an earlier chapter. A very interesting chapter on "Propulsion and Powering" follows in which the problems of the screw propeller are considered, more particularly with regard to the relationship between horse-power of engines and speed of vessel. There is a very practical chapter on the operation, management and repair of the various details of a ship's machinery, and the volume concludes with over 220 pages devoted to the various calculations and computations the marine engineer is called upon to make.

It will be seen from the above survey that the book covers the whole field of marine engineering, and it would be difficult to name any particular detail which escapes the author's attention. There are a few of those "Americanisms" which are somewhat disconcerting to the English reader, and in the description of various typical machines or parts it is the work of American firms that is described when we would wish to read the description of a familiar English made machine, but these are the penalties from which we cannot escape when reading an American text book. We could wish, however, that it might be possible to do an English edition of this excellent work, for we feel assured that some such book is wanted on this side, and that, once prepared, the demand for the issue would more than justify the cost involved.

THE ACOUSTIC EFFICIENCY OF FOG SIGNAL MACHINERY.*

In the year 1873 the Trinity House of Great Britain set on foot trials with sound signals, following on a visit of a Committee of Elder Brethren to the United States the preceding year. A special committee was appointed to carry out these tests with the advice and assistance of Professor Tyndall, then scientific adviser to the corporation. An elaborate series of experiments was carried out at South Foreland, near Dover, the results of which formed the subject of a lengthy report. Tyndall's contributions were presented to the Royal Society of London, and his memoir on the subject was published in the Transactions for the year 1874. The subject is dealt with at length in Tyndall's well-known work on "Sound," which has proved an invaluable guide and inspiration to so many workers on the subject of acoustics. In these tests the audibility of the signals was estimated entirely by ear. This is, of course, the most simple and practical method of carrying out the test, inasmuch as the experiment is carried out under the same conditions as when the signals are heard by the navigator himself. As a method of comparing the relative merits of different types of fog-signal installations, this procedure leaves little to be desired, and information derived in this simple manner has been invaluable in the

* Abstract of paper read before the Franklin Institute by Louis Vessot King, M.A. (Cantab.), D.Sc., F.R.S.C.

progress of fog-signal engineering. The results of this investigation are admirably summed up in a later Trinity House Report for 1901, as follows :—

"(1) The passage of sound through the atmosphere is not impeded by fog, or by falling snow, hail or rain ;

"(2) The most powerful sound-producing instrument then known was the siren as used in the United States ;

"(3) No sound signal should be relied on for being heard at a greater distance than two or three miles ;

"(4) Sound shadows may be formed by the intervention of points of land or the interference of the reflected sounds with the direct waves, whereby a signal may be rendered much less effective or quite inaudible in the area of such a sound shadow ;

"(5) An opposing wind seriously obstructs or diverts the passage of sound waves, while to leeward the sound travels to great distances without any serious interference ;

"(6) In an optically clear atmosphere the air may be rendered flocculent to sound by the existence of invisible acoustic clouds formed by air currents differently heated or differently saturated with vapour."

In the year 1901, an important series of tests was carried out by a special committee of the Trinity House under the scientific direction of Lord Rayleigh and Sir Thomas Matthews, Engineer-in-Chief. The object of the trials was to discover the relative merits of various new types of fog-signal machinery. The experiments were carried out at St. Catherine's Point, Isle of Wight. Several members of the Committee always participated in estimating the strength of the signals by ear. These tests, have, to a large extent, determined existing practice in Great Britain and Canada since that time. It was decided that in operating compressed-air sirens little advantage in range of audibility accrued from raising the pressure about 25 lb. per square inch. For calm weather a low-pitched note (about 180 complete vibrations per second) was considered most suitable ; when the wind was opposed to the course of the sound-waves or when the sea was rough and noisy, it was found that a high-pitched note penetrated farther than a low-pitched one. The physical significance of these observations was discussed in a paper by Lord Rayleigh, published in the *Philosophical Magazine* for 1903.

While a blast is being sounded from a siren which can be heard about eight miles on a good day, energy is being expended at the rate of about 100 h.p. While the high note of a Scottish signal tested at St. Catherine's was being sounded, the expenditure of as much as 600 h.p. was required. Lord Rayleigh raised the question as to whether these enormous powers are really utilised for the production of sound, or whether from some cause, possibly avoidable, a large proportion may not be wasted. By means of a simple mathematical calculation relating to the 7-in. disc siren tested at St. Catherine's, Lord Rayleigh concluded that the maximum pressure-change (estimated at $\frac{1}{180}$ atmosphere) in the sound-wave produced was but an insignificant fraction of the operating pressure (25 lb. per square inch), and inferred that the conical trumpet acting as a resonating tube played an important part in utilising the pressure of the compressed air. He also believed that a large proportion of the power applied to existing forms of sirens was not converted into sound, and that there was room for improvement in their construction with a view to reducing the very large demands made.

The experience of the French fog-signal engineers is summed up in a work published in 1908 on lighthouses and marine signals by Dr. C. Ribière, the Engineer-in-Chief, and for the most part the results of the French experiments agree with those of the British and American engineers, but a great deal of insistence is placed upon the desirability of obtaining further knowledge on the subject of the *acoustic efficiency* of fog-signal machinery. Ribière definitely suggests that sound-waves generated by a siren probably bear a close relationship to explosive waves whose mode of propagation has long been known to be very different from that represented by the classical theory of ordinary acoustics.

The type of fog-alarm which has found favour in Canadian waters and has been installed in many localities is a modified form of compressed-air siren, of extremely elegant mechanical construction, an invention of Mr. J. P. Northey, of Toronto, called by him a "diaphone." The essential feature of this apparatus consists of a hollow piston in which are cut a number of equidistant circular slits or ports whose planes are perpendicular to the axis. This piston fits closely in a cylinder in which are cut corresponding slits. These are alternately opened and closed by the vibratory movement of the piston. These oscillations are produced by means of a special driving head fitted with a valve-system somewhat resembling that of a compressed-air riveter. Air at a pressure of about 25 lb. per square inch is supplied from compressors and storage tanks to a chamber surrounding the exterior stationary cylinder. As the hollow piston vibrates, the intermittent puffs of air generated give rise to intense sound-waves which are propagated to the external atmosphere through a continuation of the outer cylinder in the form of a short conical trumpet tuned to resonance with the pitch of the signal note, about 180 complete vibrations per second. A most important characteristic of the diaphone is the fact that a very considerable variation of operating pressure has very little effect on the pitch of the signal note. This apparatus gives rise to an extremely powerful and well-sustained note whose quality as heard in the distance was, as far as could be judged, that of a very nearly pure tone. At the end of a blast, the slowing down of the piston gives rise to a short and powerful terminal note of diminishing pitch. This "grunt" (as it is designated at sea) is characteristic of the diaphone signal and is of great practical importance in navigation, not only in differentiating the note from that of ship-siren, but in enabling the direction of the signal to be estimated with fair accuracy. This peculiarity was entirely unexpected in the development of the diaphone and is emphasised in modern installations. If a fog-signal generator is just audible on a favourable day at 10 miles (no very great distance for a modern type of apparatus such as that at Father Point), we are able to calculate that the expenditure of energy at the resonator should be a little less than one-third of a horse-power. The diaphone we are considering gives two blasts of 3 seconds each per minute. In order to provide sufficient air, a 10-h.p. gasoline engine operates continuously, compressing air into the storage tanks to be all expended in one-tenth of the interval required to make good the air lost. It follows that, in terms of the engine-power supplied, energy is expended at the rate of 100 h.p. during a blast. We are told in the St. Catherine's report that when the high note of the Scotch siren was being sounded, energy was being spent at the rate of 616 h.p. The amount of mechanical energy required to produce the notes on the musical instruments mentioned is easily measured, so that their *acoustic efficiency*, or ratio of energy input to acoustic output may be determined. To quote a few of the determinations only, the acoustic efficiency of the violin comes out to be 0·00052 or about one part in 2,000. That of the cornet is in the neighbourhood of 0·0011, or, roughly, twice as great, while the human voice comes out surprisingly well with an efficiency of 0·0095, or nearly 1 per cent.

If we turn from the attempts of theory to consult the verdict of experiment, which constitutes a court of high appeal to which we must ultimately have recourse, we find that it has long been known that very intense waves, such as those caused by the detonation of explosives, have a velocity distinctly greater than that of ordinary sound. This subject has been studied in great detail by M. Vieille, Engineer-in-Chief of the French Ordnance Bureau, who showed that the velocity of the wave generated by the sudden rupture of a thin metal diaphragm under a pressure of 27 atmospheres is nearly double that of ordinary sound, while that of the waves generated by the detonation of modern high explosives attains as high as three times the normal value.

It is thus evident that we must be prepared to meet with very abnormal conditions in studying the signals emitted by a diaphone, especially close to the oscillating piston. In this locality the sound-waves probably resemble intermittent explosive waves rather than normal waves, and it was thus necessary to devise a method of efficiency measurement entirely independent of any acoustic theory, and for the purpose a thermodynamical method, generally applicable to any type of compressed-air machinery, was developed.

The details of the experiments carried out by the author on the Father Point fog-signal during the month of September, 1913, may be of interest. Through the courtesy of the Department of Marine and Fisheries, permission was given to operate the diaphone at will for the purpose of the tests. Through the kindness of the Postmaster-General, permanent quarters on the mail tender, *Lady Evelyn*, stationed at Rimouski, were provided, and use of this ship in carrying out acoustic surveys in the neighbourhood of the Father Point signal, a few miles away was given. The fog-signal itself had only to be started by the Father Point light-keeper to continue running without further attention, the pressure remaining remarkably constant. As has already been pointed out, small fluctuations of pressure are with very little effect on the pitch of the note emitted. This circumstance, together with the smoothness and purity of the tone of the Northey diaphone, contributed very materially to the success of the acoustic survey.

The results obtained have enabled us for the first time to form some estimate of the amount of power delivered by a siren as sound. In the particular diaphone tested, operated under the best conditions, it was found that nearly 2½ h.p. (2·36 h.p. in one of the tests) may be so utilised. Observations were taken with the diaphone sounding at different pressures, so that the corresponding variation of acoustic output could be studied. Pressures were accurately measured by means of a mercury gauge. By measuring the fall of the gauge during a six-second blast it was possible to calculate the total air-consumption, knowing the volume of the storage-tanks and the rate of compression of the engines. Several series of observations gave fairly concordant results for the acoustic outputs at different operating pressures. In each of the tests, the over-all efficiency attained its maximum value at an operating pressure in the neighbourhood of 20 lb. per square inch above atmospheric. In one instance the maximum was nearly 6 per cent.; in another, after some adjustments to valves admitting air to the diaphone, the maximum rose to a little over 8 per cent. Full details of these tests will be found in a detailed account of the work which will be published shortly.

It will be generally conceded that a great deal remains to be done in this field. Regarding a sound-generator as a mechanical means of converting some sort of motive energy into sound, it is apparent that an over-all efficiency of 6 to 8 per cent. (or probably twice as high in the newer types of diaphones) leaves considerable room for improvement, although these numbers are many times greater than those derived for small-powered musical instruments.

The questions which remain to be solved by future work may be stated as follows:—

(1) Is there any limit (as in the case of ordinary heat-engines) to the proportion of power capable of being converted into sound-energy?

(2) How much of the sound-energy, once delivered as such at the narrowest part of the siren-trumpet, is wasted owing to losses in the trumpet itself and in the atmosphere outside?

These were questions which it was proposed to attack theoretically and experimentally in a continuation of these tests to be carried out in the autumn of 1914, when the declaration of war put an end to all work of this kind by the diversion of activities to more pressing duties. The preliminary work which has been described may, however, be of some utility, in enabling engineers to proceed with a greater degree of confidence in the design and testing of fog-signal machinery.

THE FIRST STANDARD SHIPS.

In our last week's issue we published a series of photographs representing different views of both the interior and the exterior of the first Government standard ship, some of which had been taken during the earlier stages of construction. In this week's issue, on pages 321 to 324, we publish a second series of official photographs in which the first standard ship is seen completed and work is in progress on succeeding vessels.

In the first photograph the first standard ship is seen moving down the launching ways and just taking the water, whilst the second photograph below shows men at work on the poop deck after the vessel had been berthed in the fitting-out basin.

It is the essence of standardisation that the production of one article shall follow almost automatically upon the one preceding it, hence it is essential that upon one ship leaving the ways work shall immediately be commenced upon the next. The two photographs shown on page 322 indicate this process operating in standard ship production. The upper photograph shows one vessel just taking the water, and already men are preparing the slipways by scraping away the grease ready for the laying down of the succeeding vessel, and in the photograph below, the keel plates are actually being laid "within 15 minutes of the slipways being vacated," according to the official description. Of course, the work of preparing the plates in the yard must have been put in hand long before the first ship was ready for launching, and the preparing of parts at such a time that they shall be ready to be built into the ship when required is also an essential feature of the policy of standardisation.

The next photograph shows the deck of the standard cargo vessel looking forward from the bridge; it was taken whilst the ship lay in the fitting-out basin, and it will be observed that she was very nearly completed. Below, a view of the deck as seen from the forecastle is given; the photograph was taken when the vessel was ready to put to sea, and gives a good idea of the arrangement of the cargo derricks, winches, lifeboats, &c.

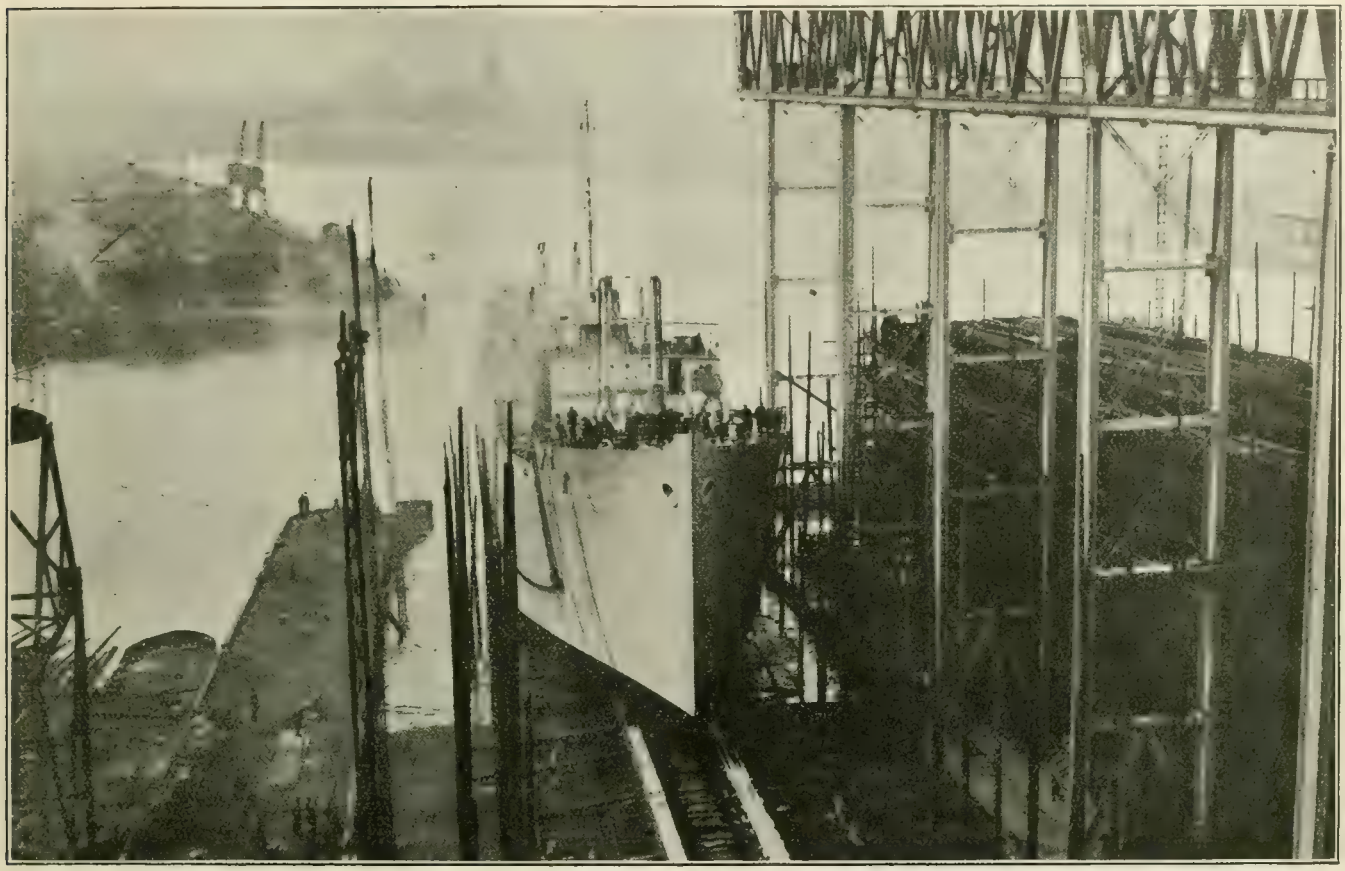
The first of the Government's standard ships is commanded by Capt. J. McKie, the first officer being Mr. J. Adams. In the next photographs these two officers are seen on the bridge of their ship just prior to her putting to sea for the trial trips. Below, the photograph represents a corner of the seamen's smoking room. It will be recalled that the accommodation for the seamen forms one of the novel features of these vessels. Situated aft it comprises, in addition to the smoking room shown, cabins in which there are only two bunks and a separate messroom.

The official photographs in this and in last week's issues have been published by special permission of the Press Bureau, and were taken for the Press Bureau by the Topical Press Agency.

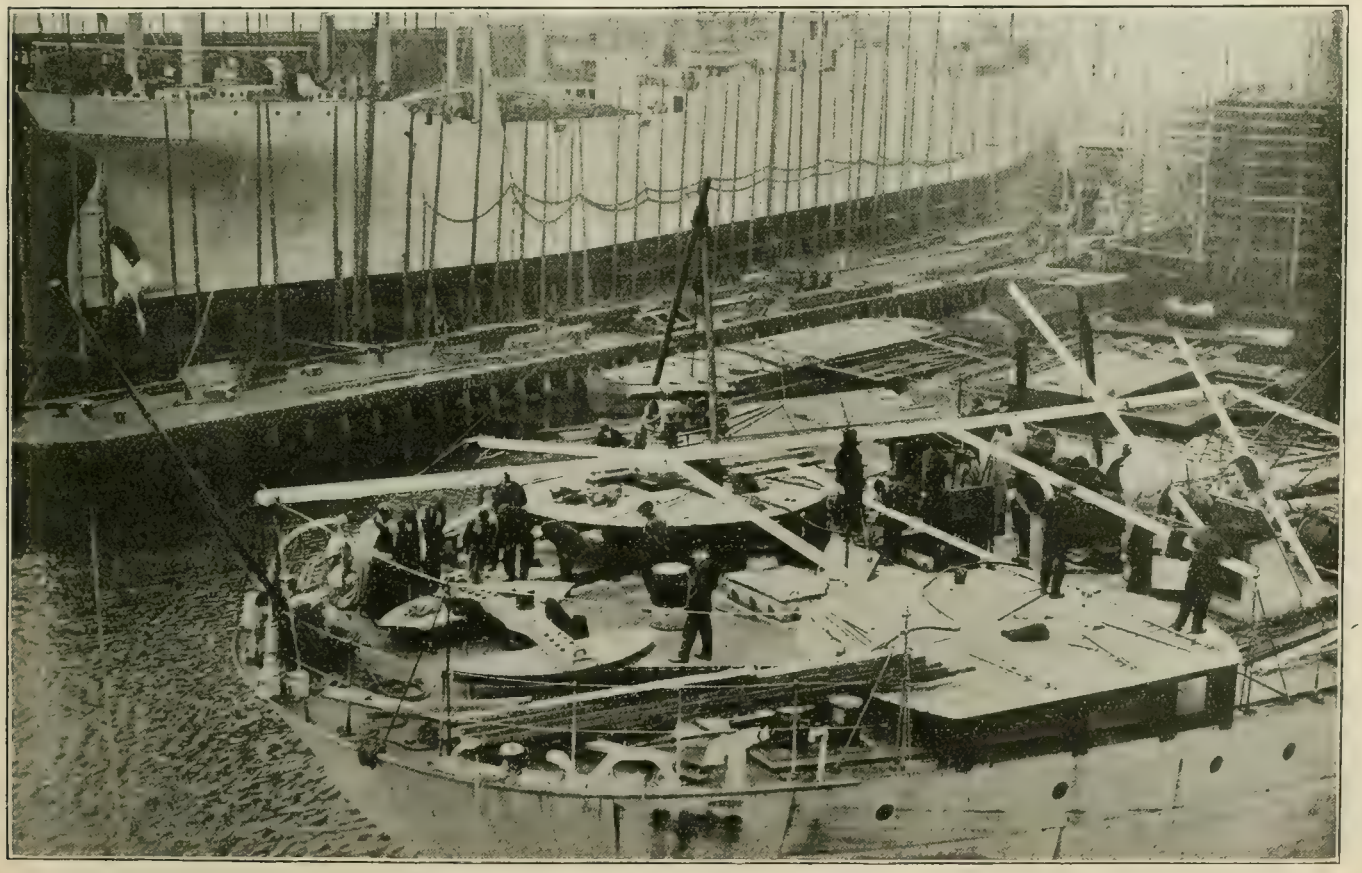
FERRO-CONCRETE SHIP CONSTRUCTION.

During the last three months the Committee of Lloyd's Register of Shipping have approved plans for the construction of a number of non-propelling barges, some of them designed to carry 500 tons deadweight, and also of a motor vessel, to be built of ferro-concrete in the United Kingdom and in Norway for the British and Scandinavian coastal trades. These vessels will be built under the inspection of the society's surveyors, with a view to classification in Lloyd's Register Book. Plans of other ferro-concrete vessels of larger carrying capacity are under consideration.

One of the society's principal surveyors has recently made a tour of inspection in Scandinavia, where, owing to circumstances arising from the war and other causes, the use of the ferro-concrete system of ship construction has, so far, been most developed. The report of this visit has naturally placed the Committee of Lloyd's Register in possession of most valuable data on the subject. The possibilities of ferro-concrete as a material for shipbuilding purposes are arousing keen interest throughout the shipping community at the present time, when the shortage of steel and the relative scarcity of skilled labour are factors of so much importance.

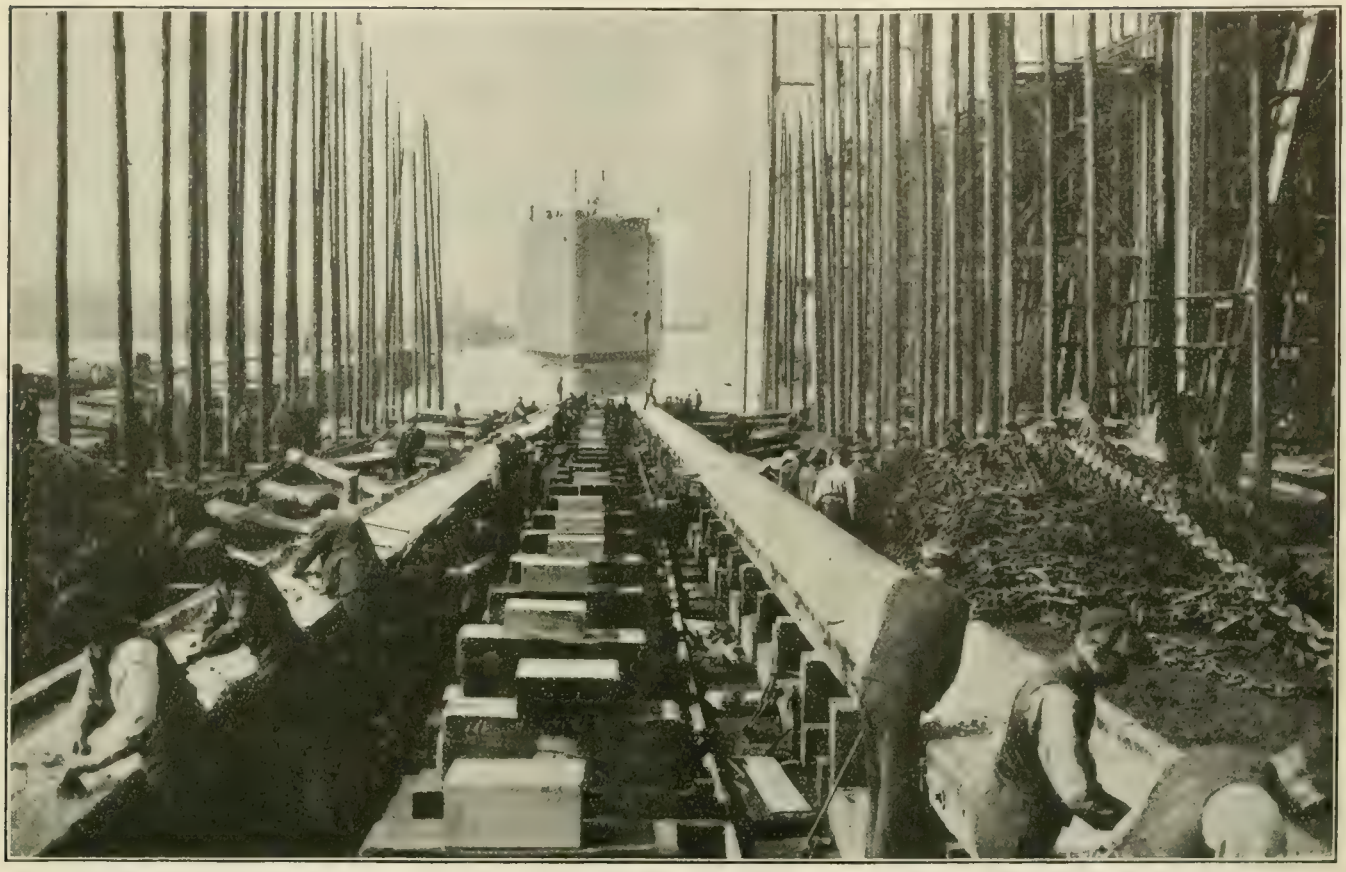


Standard Ship taking the Water.

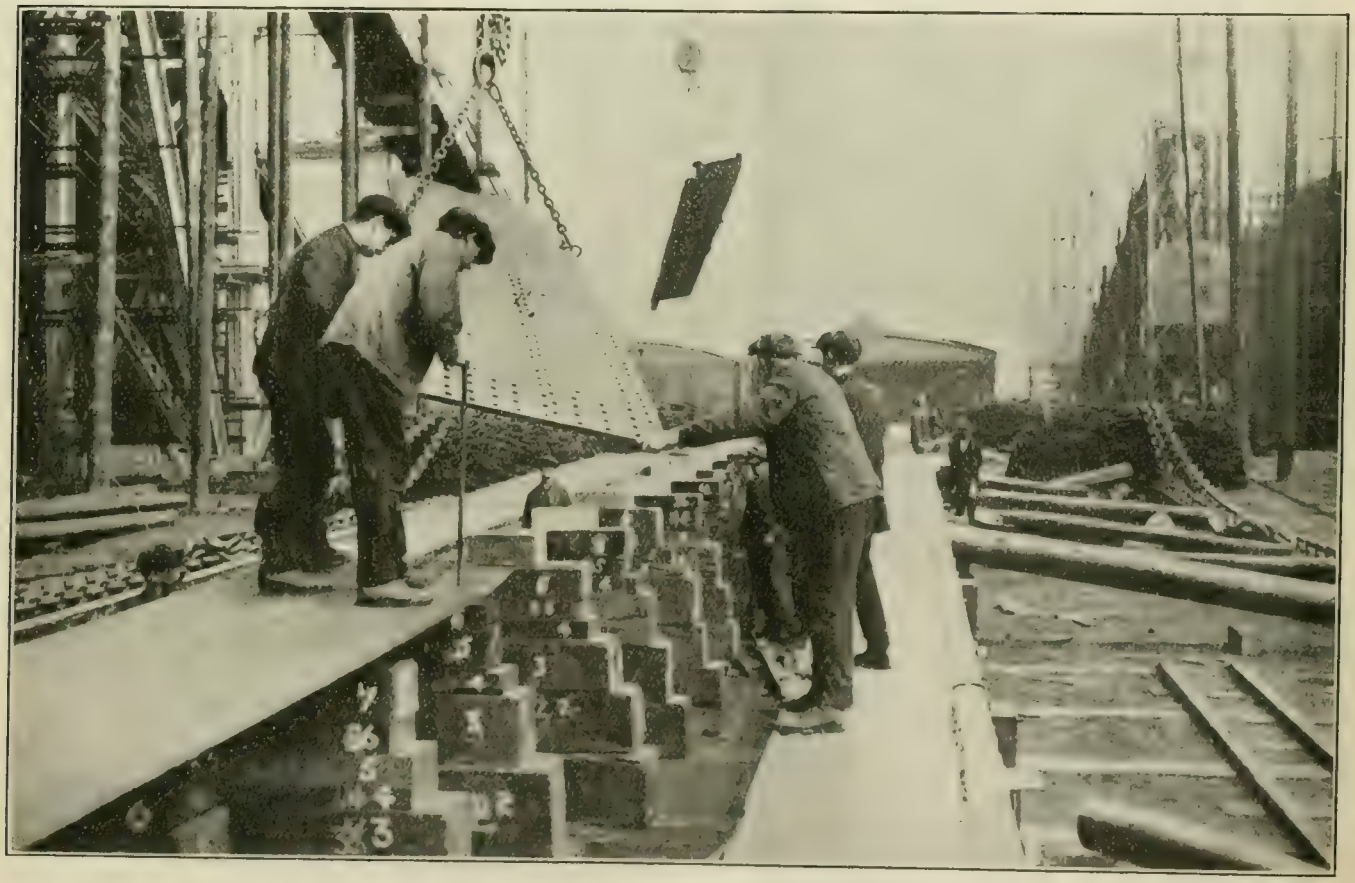


Men Working on Poop Deck of Standard Ship.

[Official Photographs issued for the Press Bureau by Topical.



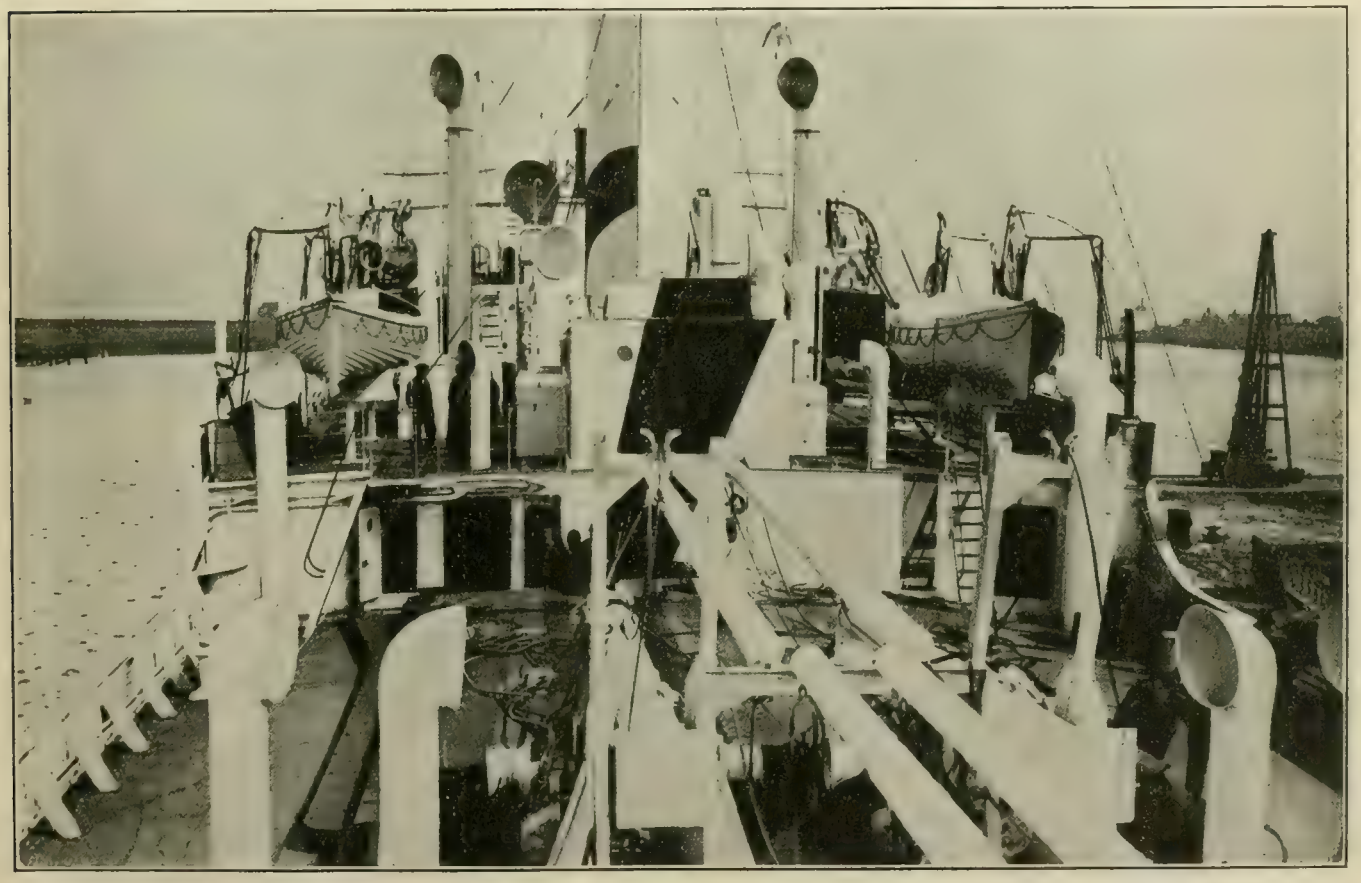
Men Preparing the Slips for the Next Ship.



Laying Keel Plates immediately after Launching.

[Official Photographs issued for the Press Bureau by Topical]

Men at Work on Deck of Nearly Finished Tramp.



Completed and Ready for Sea.

(Official Photographs issued for the Press Bureau by Topical.

Captain and First Officer of First Standard Ship.

A Corner of the Seamen's Smoking Room.

[*Official Photographs issued for the Press Bureau by Topical.*

CLEARANCE VOLUME IN ENGINE CYLINDERS.

The general effect of cylinder clearance on the indicator diagram has been more or less fully dealt with by the various authors on the steam engine, but the writer's experience has shown that this important point is often lost sight of in the designing of engine cylinders, especially of the marine type, with the result that excessive clearances are given which are detrimental to efficient working, and it may therefore be of advantage to re-examine its general effect on the economical working of the steam engine. It is generally understood that the measure of the cylinder clearance is the volume enclosed by the surface of the piston and cylinder end, plus that of the steam supply passages or ports to the cylinder, and theoretical reasoning backed by practical experience has proved that to obtain the most economical results, this space must be reduced to a minimum. In steam engine cylinders in which the same passages are used for the admission and rejection of steam from the cylinder, the surface area of these passages are subjected to considerable variations in temperature, and thus considerable losses are incurred by condensation of the incoming steam on meeting the relatively cold surfaces of these ports.

At the beginning of the piston's stroke the clearance volume must be filled with live steam at the initial working pressure, if the piston is to perform its work properly, and if it be assumed for the moment that no compression takes place on the return stroke, then this clearance steam will be almost entirely lost to the exhaust. On account of the greater weight of steam contained in the cylinder during expansion, than would be in the case with zero clearance, the expansion line is slightly raised towards the exhaust end which increases slightly the area of diagram and work done, but this increase is small and is not at all commensurable with the extra steam being used. The practice of limiting the exhaust period and giving some compression to the steam at the end of the return stroke, neutralises to a certain extent the adverse results obtaining from excessive clearance, and at the same time is beneficial in the obtaining of a smoother running engine due to gradual bringing of the moving parts to rest, but it does not entirely eliminate the losses incurred. In an engine having full expansion of the steam down to the back pressure line, theoretical reasoning would expect that the greater the compression given and the nearer the compression pressure equalled the pressure of admission, the greater would be the neutralising effect ; and with compression equal to the admission pressure, the admission steam would be entirely used for doing useful work. In the practical engine, however, full expansion cannot be given, as allowances must be made for wire drawing, &c., and a pressure drop must be allowed to give free exhaust from back of piston, and under these conditions too much compression might possibly constitute a loss instead of a gain. Experimental tests made on engines having different percentages of clearance have shown that compression to the initial pressure has led to inferior results compared to those obtained with only moderate compressions. Professor R. C. Carpenter in a study of the structure of steam engines which have produced the best results in steam consumption for given ranges of pressure and temperature, says that the best results are obtained by those engines which have the smallest clearances, and that builders of high-class engines do not depend on the annulling of the effect of clearance by giving too high compression. The result of clearance on the economical working, based on theoretical considerations, may be shown as follows :—

Taking first the case in which no compression is given at the end of return stroke. If the given figure represents an ideal indicator diagram, the full lines representing what would take place under zero clearance, and the dotted lines the result of clearance volume. It may be assumed for this purpose that the expansion line is hyperbolic, and if "W_1" represents the area enclosed for the case of zero clearance, then we have by the well-known equation

$$W_1 = p_1 V_1 \left(1 + \log_e \frac{V_2}{V_1}\right) - p_b V_2 \quad \ldots\ldots\ldots\ldots (i)$$

If the engine be now assumed to have the clearance volume C, as indicated by dotted lines, then the expansion would rise towards the exhaust end as also shown dotted, and if "W_2" represents the work done under this condition we have

$$W_2 = p_1 (V_1 + C) \left\{1 + \log_e \frac{V_2 + C}{V_1 + C}\right\} - p_b V_2 - p_1 C \quad \ldots\ldots\ldots\ldots (ii)$$

By assigning values for the various factors in these equations, the value of W_1 and W_2 may be determined, and by comparing these two values with the corresponding quantities of steam used, the advantages of small clearance will be readily seen. Suppose we take for an example the high pressure cylinder of an ordinary marine triple expansion engine, having a cylinder ratio of 7 to 1. Let the initial working pressure p_1 be assumed at 195 lbs. per sq. in. absolute, with a cut off of say 60 per cent. of the stroke, the back pressure p_b on the H.P. piston would be about 70 lbs. absolute, taken on the relative volume of the cylinders. The clearance volume "C" may be assumed at 15 per cent. of the volume swept through by high-pressure piston, then by substitution of these values in equation (i) we get

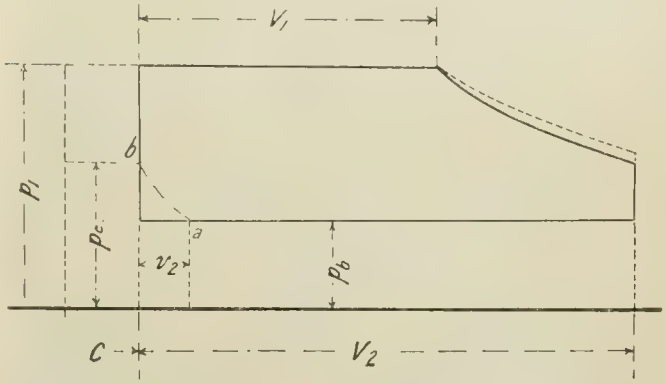
$$W_1 = 195\ V_1 \left(1 + \log_e \frac{1}{\cdot 6}\right) - 70\ \frac{V_1}{\cdot 6} = 178\ V_1 \quad \ldots\ldots\ldots\ldots (ia)$$

For the problem under consideration we can take the amount of steam used per stroke with zero clearance proportional to V_1, then the work done per lb. steam used would be proportional to $\frac{W_1}{V_1}$ or $a \frac{178\ V_1}{V_1} = 178\ K$ where K is some constant.

With the clearance volume C = 15 per cent. of V_2, *i.e.*, $\cdot 25\ V_1$ we have by equation (ii)

$$W_2 = 195 \times 1 \cdot 25\ V_1 (1 + \log_e 1 \cdot 53) - 117\ V_1 - 49\ V_1$$
$$= 182\ V_1 \quad \ldots\ldots\ldots\ldots (iia)$$

In this second case the amount of steam used per stroke is proportional to $(V_1 + C)$ or $a\ 1 \cdot 25\ V_1$ and the work done per lb. steam used would now be proportional to $\frac{W_2}{1 \cdot 25\ V_1}$ or $a \frac{182\ V_1}{1 \cdot 25\ V_1} = 146\ K$ or the work done with clearance is only 82 per cent. of that theoretically possible, with zero clearance volume. The losses for the other cylinders would be less than this, owing to the reduced percentage clearance with the larger cylinders, but the example chosen will show the importance of minimising this item of wastefulness.



Ideal Indicator Diagram showing Effect of Clearance.

We may now consider the effect of giving some compression to the steam on the exhaust stroke. Let the compression commence at a distance V_2 from end of return stroke, and assume the steam to be compressed into the clearance space as indicated by the chain dotted curved line "$a\ b$" in the given figure. The work done under this condition would now be represented by the equation

$$W_3 = p_1 (V_1 + C) \left(1 + \log_e \frac{V_2 + C}{V_1 + C}\right)$$
$$- p_b \left\{V_2 - v_2 + (v_2 + C) \log_e \frac{v_2 + C}{C}\right\} - p_1 C \quad \ldots\ldots\ldots (iii).$$

If it be assumed that compression begins at $\frac{1}{10}$th of the piston's stroke or $v_2 = \frac{1}{10}\ V_2$, then by rationalising this equation we would obtain $W_3 = 179\ V_1$ ..... (iii*a*).

The remaining steam in the cylinder is compressed into the clearance space up to the pressure p_c, and before the piston again moves outward this pressure is raised by the admission of live steam to the initial working pressure p_1, and the volume of live steam admitted to the clearance space would be given by the relation $V = \frac{p_1}{p_1} - \frac{p_c}{p_1} \times C$, the total amount of steam used per stroke would be proportional to $(V_1 + V)$, which on substitution will be found to vary as $1{\cdot}1\ V_1$ and the work done per lb. steam would now vary as $\frac{W}{1{\cdot}1\ V_1} \propto \frac{179\ V_1}{1{\cdot}1\ V_1}$ 163 K, which is now equal to 91 per cent. of that theoretically possible with zero clearance, and clearly shows the benefits obtaining by compression. It may be noted, however, that in the actual engine the expansion line is not by any means hyperbolic. Due to imperfections of the ordinary valve gears, considerable wire drawing of the steam takes place during the expansion stroke, and the comparisons as given will not strictly hold, but the results may be sufficient to indicate generally the adverse results obtaining with excessive clearance. The compression to give the most efficient working for a certain clearance with a particular engine, can only be determined from experiment, but the majority of experiments made, seem to show that the compression necessary should be just enough to obtain smooth running of the engine.

AMERICAN SHIPPING PROGRAMME.

A statement has been prepared by the United States Shipping Board for presentation to Congress setting forth particulars of the shipping programme which it is desired to carry out with a view to developing a huge mercantile marine for the purposes of the war. The programme falls into three parts, dealing with building, commandeering, and purchase. A brief summary is appended.

Building.

Under this heading 433 ships of nearly 2,000,000 tons have already been contracted for at an estimated cost of $285,000,000 (£57,000,000); 452 ships of nearly 3,000,000 tons are ready to be contracted for when funds are available at a cost of $455,500,000 (£91,100,000), and in addition 237 ships of 1,281,000 tons are under negotiation, representing an estimated cost of $194,000,000 (£38,800,000). One hundred and fifty miscellaneous vessels of 1,800,000 tons account for $300,000,000 (£60,000,000); organisation and other miscellaneous expenses are put at $35,000,000 (£7,000,000). The amount authorised by Congress on June 6 last was $550,000,000 (£110,000,000), of which $300,000,000 (£60,000,000) are appropriated. The amount to be authorised for the building programme immediately in sight, making no allowance for changes in cost of labour and material, is $790,500,000 (£143,900,000).

Commandeering.

Under the heading of "commandeering" the amount required for commandeered ships is put at $515,000,000 (£103,000,000). Of this sum $250,000,000 (£50,000,000) has already been authorised by Congress, leaving a balance of $265,000,000 (£53,000,000) requiring authorisation by Congress.

Purchase.

The cost of vessels to be purchased other than under construction or commandeered is $150,000,000 (£30,000,000).

An additional amount of $1,134,500,000 (£226,900,000) is to be asked for from Congress, made up of the following items.

The total amount, in round figures, to be purchased, in addition to amount already authorised :—

	$	£
For commandeered vessels	265,000,000	(53,000,000)
For construction of new vessels ...	719,500,000	(143,900,000)
For purchase of new vessels	150,000,000	(30,000,000)
	1,134,500,000	(226,900,000)

The amount desired to be appropriated for the remainder of the fiscal year 1918 is $915,000,000 (£183,000,000), consisting of the following items :—

	$	£
For commandeered vessels	365,000,000	(73,000,000)
For building programme	400,000,000	(80,000,000)
For purchase of vessels	150,000,000	(30,000,000)
	915,000,000	(183,000,000)

As an instance of the way in which this vast amount is being expended the correspondent of *The Times* states that the Emergency Fleet Corporation who are responsible for the new construction undertaken for the United States Government, has contracted for 40 composite steel standardised ships of 9,000 tons d.w., at a basic price of $1,305,000 (£261,000) each. As in the case of both the previous contracts for composite steel vessels the Government will build and own the yards. Congress is planning appropriation of $35,000,000 (£7,000,000) for the three yards.

We comment upon the position produced by this colossal programme editorially (see page 316)

DEVELOPMENT OF GERMAN WATERWAYS.

With regard to the projected development of German waterways the *Board of Trade Journal* refers to the *Handel und Gewerbe* of July 28, which states that the Imperial authorities intend to make a contribution to the cost of the plans for such development.

According to that publication, there appears in a third supplement to the Imperial Budget for 1917, which has been passed by the Bundesrat and laid before the Reichstag by the Imperial Chancellor, the non-recurring item of 1,200,000 marks as a contribution to the working out of plans for the development of the German system of waterways.

After a preliminary statement as to the importance of the German waterways, and especially the economic advantage to be derived from their connection with the Dunube, the following indication of the attitude of the Imperial authorities towards the whole question is given :—

The Imperial authorities will contribute to the cost of the working out of plans whose execution would be to the economic advantage of Germany as a whole. Such plans comprise, in the first place, the connection of the Rhine with the Danube by the Main, the Neckar, or Lake Constance; and, further, the provision of waterway connections in the watershed of the Weser, the Elbe, and the Oder.

The preliminary allocation of the 1,200,000 marks is as follows :—

For plans for—

(*a*) A waterway for large vessels from Aschaffenburg to the frontier of the Empire below Passau, 700,000 marks.

(*b*) A waterway for large vessels from the Rhine to the Danube, by way of the Neckar, including rendering the Danube navigable from Ratisbon to Ulm, and connection of the Upper Rhine with the Danube via Lake Constance, 100,000 marks.

(*c*) Other schemes, 400,000 marks.

The detailed allocation of these amounts, which in no case are to constitute more than two-fifths of the outlay necessitated, is to be arranged by the Imperial authorities with the authorities of the particular States in question. The Imperial participation in the outlay on plans is solely to ensure the testing of the feasibility and value of the separate schemes from the point of view of Imperial interests; it in no way prejudices any future decision on the part of the Imperial authorities as to whether, and to what extent, they should undertake part of the costs of execution of one or other of the schemes.

New Shipping Company at Groningen.—A company has been formed at Groningen, under the title of the Naamlooze Vennootschap Zeevaart Maatschappij "Groningen," with a capital of 1,500,000 florins, of which 500,000 florins are fully paid up. The company has already put into service three motor ships, while three motor schooners and two other vessels are under construction.

GENERAL NEWS SECTION.

PERSONAL.

Mr. John Maccoy, mayor of Gateshead, and Mr. J. W. Witherington, have been elected to represent Newcastle shipowners on the Tyne Pilotage Board.

Mr. A. Munro Sutherland, chairman of the Sutherland Steamship Co., Ltd., and Sheriff of Newcastle, has given £1,000 to found a hostel for the use of disabled sailors and soldiers who are to be trained in new trades at Rutherford College in that city.

Mr. A. Hughes, of the drawing office staff of Harland & Wolff, Ltd., has been presented by his colleagues with a leather wallet suitably inscribed and £10 in recognition of his having jumped fully clothed into the river Lagan to rescue a boy. Mr. R. W. Kent, of the turbine department, made the presentation.

Mr. Joseph Short, J.P., managing director of Short Brothers, Ltd., shipbuilders, Pallion, Sunderland, and a Director of the Hindustan Steam Shipping Company, Ltd., who died on May 13, aged 59 years, has left estate of the gross value of £305,910, including personalty of the net value of £292,416.

The death has occurred, at Hull, at the age of 82 years, of Captain George Soulsby. During his long career he was intimately associated with the shipping life of the port. After his retirement from the sea in 1891 he devoted himself to the work of the Trinity House and to various philanthropic and religious causes.

Lieut.-Colonel H. Luhrs, C.M.G., a well-known marine engineer, and, until the war broke out, one of the managers of the North Eastern Marine Engineering Co., Ltd., Wallsend, now holds a responsible position at the Ministry of Munitions. He has been on a visit to Tyneside this week, and has received cordial greetings from many old friends.

Lieutenant George Robson, Seaforth Highlanders, whose death in action is announced, was an only son of the late Mr. George Robson, of George Robson, Ltd., engineers, Tyne Dock. Seven years ago the deceased officer went to Odessa, where he received an appointment as Lloyd's surveyor, but on the outbreak of war he enlisted in the Seaforth Highlanders.

Lieut. John Blyth, R.N.R., has been awarded the D.S.O. Before the war he was second officer on one of the Holt Line vessels. He has latterly been in command of an armed trawler, and the award is for distinguished service in action with enemy submarines. Lieut. Blyth is the son of the late Captain Blyth, a well-known Liverpool shipmaster, who was one of the founders of the Imperial Merchant Service Guild.

Mr. J. Bourn, general manager of the Tyne Iron Shipbuilding Company, Willington Quay, presented Daniel Machell, a labourer employed at the yard, with the Royal Humane Society's testimonial on vellum, and also a gold watch and albert, on behalf of the officials and workmen, in recognition of a gallant attempt to save a fellow workman from drowning on July 15. Machell, who is 61 years of age, jumped feet first from the deck of a vessel into 30 feet of water, but did not succeed in saving the man who had fallen into the river.

The funeral took place on Sept. 29 of Mr. James Barnes, chairman and managing director of Charles Howson & Co., Ltd., engineers and ship repairers, Regent Road, Liverpool, who died on the previous Wednesday after an illness extending over several months. He was 72 years of age, and when a lad of 14 he entered the works of Howson & Pritchard, and on the retirement of Mr. Pritchard in 1867 he was admitted a partner of the firm. In 1870 Mr. Charles Howson died, and Mr. Barnes took over the sole control of the business which is now carried on as a limited company by his three sons under the old title of Charles Howson & Co., Ltd.

Major J. A. Gibbs, D.S.O., a partner in the firm of Gibbs & Co., shipowners, of Merthyr House, Cardiff, was killed on September 20, while on service in France. Major Gibbs was 37 years of age, and the second son of the late Mr. John Angel Gibbs, shipowner, of Cardiff. The deceased gentleman was well known in Cardiff shipping circles. He joined the Army soon after the war started as a trooper in the Glamorgan Yeomanry, and later received a Commission in the Welsh Regiment, proceeding to France early in 1916. He took part in the operations on the Somme last year, and for conspicuous gallantry was mentioned in Sir Douglas Haig's dispatches, and was awarded the Distinguished Service Order.

Captain William McLeod, of Sunderland, master of the steamship *Silverdale*, was at the Cardiff Exchange last week presented with a silver medal and Diploma of Honour, given by the Shipping Federation, for gallant conduct at Barry Docks in February last. The presentation was made by Mr. W. W. Jones, the Chairman of the Cardiff district of the Shipping Federation. The chief officer of the *Silverdale*, Joseph Hall Robinson, West Hartlepool, fell from the bridge deck of the ship, and striking his head against some iron on the harbour deck, he rolled over into the dock. Captain McLeod leaped over the ship's side into the dock, and succeeded in finding Robinson several feet below the surface. Although the water was bitterly cold, with the aid of a lifebuoy he held on to the officer, who was unconscious and motionless, for fully 20 minutes, until a boat arrived to pick them up. Robinson was conveyed to the Town Accident Hospital, where he died.

PORT NOTES.

Newcastle, N.S.W.—It is intended to provide, as soon as possible, 30 ft. of water at the entrance to this port, and, as a result, it is expected that many more ships will make use of it. New wharves are also to be built, and a floating dock capable of taking vessels up to 12,000 tons is to be ordered.

Curaçao.—The deepening and widening of the Willemstad harbour entrance is progressing, and will probably be completed about the end of this year. The firm of S. E. L. Maduro & Sons has enlarged the Motet wharf in the outer harbour and is preparing to lengthen the Juliana coal wharf in the inner lagoon. The Curaçao Trading Company improved its wharfage last year and purchased an American dredger to increase the depth at the Salazar wharf in the outer harbour.

Singapore.—The reconstruction of the main wharf in Singapore Harbour has been completed. The expenditure on these new harbour works from loan funds amounted to $12,568,101 (United States currency) on December 31, 1916, and, in addition, there has been an expenditure on works account from reserve fund of $1,296,598. The main wharf as reconstructed is 4,570 ft. long, with a broad, straight avenue extending between the main wharf go-downs and the lagoon go-downs, there also being an admirable arrangement of railways linking up the whole system.

Mobile.—Plans for the new terminal development to be made by the Gulf, Mobile & Northern Railroad, which were authorized by the board of directors a few weeks ago, have been received in Mobile by Colonel W. F. Owen, president. The plans are for three new piers and two large warehouses on the land, one six storeys high and one four storeys high. Each pier will have three double tracks of rails laid to the pier-head, and each of the three slips will hold three large or five small steamers. On two of the piers will be covered warehouses of modern design, to be so constructed that additional storeys can be added if required.

FROM OUR CORRESPONDENTS.

CLYDE DISTRICT.

(From Our Own Correspondent.)

New Scottish Research Society.—Important developments may be expected shortly in connection with the formation of a research society, the object of which will be to promote and encourage scientific and experimental research work, with special reference to the development of Scottish industries. The movement was originated by the Council of the Institution of Engineers and Shipbuilders in Scotland, and now that the Council of the London Scientific and Research Society are moving in the same direction it is probable that the Scottish Institution will co-ordinate their plans with those of the London Society. In any case, the definite aim which the Institution of Engineers and Shipbuilders have in view is the development of existing industries in Scotland and the establishment on a satisfactory basis of new trades. In this effort they hope to have the cordial support and co-operation of all sections of the community, and especially of those whose interests are likely to be furthered by scientific research. Without hearty support an organisation such as it is proposed to establish cannot attain its full measure of usefulness.

Engineers' and Shipbuilders' Institution.—Notwithstanding the war conditions the Institution of Engineers and Shipbuilders in Scotland continues its activities with undiminished zeal, and the approaching series of winter meetings which begin this month promise to be as interesting as those of past sessions. The administrative work is still carried on in the Institution's own buildings, by Mr. Parker, secretary, but as the greater part of the building is occupied by the Ministry of Munitions, the meetings of the Institution are to be held in the large lecture hall of the Royal Technical College. When the winter session opens on the 23rd inst. the new president, Mr. Cleghorn of the Fairfield Shipbuilding and Engineering Company, will be formally installed in office. The principal item on the agenda of the first meeting will be the presidential address by Mr. Cleghorn. In the course of the session a paper will be read by Mr. C. P. Hogg, civil engineer, on the proposed Mid-Scotland ship canal, a subject which has attracted a great deal of attention recently in engineering and shipping circles in Scotland. The other subjects to be discussed during the session are also of great importance to engineers and shipbuilders, and Mr. Parker is to be congratulated on the excellence of the syllabus which has been prepared.

The Transfer of Workmen.—The Admiralty Transfer Committee of the Clyde District have issued notices which have been posted this week in shipyards and other establishments engaged on Admiralty work, intimating the abolition of leaving certificates for workmen. On and after October 15, it is stated, workmen will be free to transfer their services from one establishment engaged on war work to another, without the necessity of first obtaining a clearance certificate from their present employer. In all cases, however, they must give at least a week's notice of their intention to change their employment, unless a longer period is provided for in their existing contracts of service. The Committee appeal to workmen not to change unless they have definite and substantial grounds for doing so. The attention of workers is directed to the provisions which have been made for encouraging men to remain in positions in which they are placed. The war munitions volunteer scheme has been extended, and a subsistence allowance will be given to men working away from home. Railway facilities will also be provided for men at holiday periods. The Committee are hopeful that war work will not suffer by the abolition of the leaving certificates.

Shipowner on Shipping Losses.—A statement made recently on the effect of the submarine warfare by Mr. Francis Henderson of the Anchor Line, has attracted a good deal of attention in shipping circles. After drawing attention to the fact that our mercantile marine is being depleted at the rate of about 1,000 ships per annum, Mr. Henderson states that it is necessary that some measures should be adopted for dealing with the situation. There are two courses open to us, he says. We may either act in consort with our Allies, or independantly, the idea being, however, to make it perfectly plain to our enemies that the more vessels that are destroyed by mine or submarine, so much the more will German and Austrian trade be handicapped after the war. If Britain acted alone, a public declaration should be made that until our shipping losses are made good, either in ships or money, no German or, Austrian or Turkish vessel would be allowed to enter any British. Colonial or Indian port, or obtain coal at any British coaling station. Of course, such a declaration would be immensely strengthened if we could associate our Allies with us, but delay might occur before unanimity could be arrived at. Mr. Henderson is of opinion, however, that rather than suffer delay, Great Britain should act alone in the matter.

LEITH DISTRICT.

(From Our Own Correspondent.)

Shipbuilding Development.—An important change is announced by one of the leading shipbuilding firms in this rapidly developing district. The establishments and business of John Cran & Co. will be continued and extended under the new name of John Cran & Somerville, Ltd. The partners in the old firm, Mr. John Cran (who founded the business nearly 40 years ago), Mr. James A. Somerville and Mr. J. Duncan Cran will continue to manage the concern as managing directors. The shops in Tower Street, and Shore, Leith, have, during recent years, been greatly extended, and include, with the engineering and boiler departments, shops for blacksmiths, coppersmiths, brass moulding and finishing, tinsmiths, plumbers, pattern makers, joiners and carpenters. With these facilities, whatever may be required on board a ship can be made or repaired at short notice on the premises. The shipyard at Queen's Dock is now being extended by the addition of more launching ways of a length to take vessels up to about 250 ft. long, and increased machinery will be installed to cope with the increased business. Among the vessels, which number well over 100, turned out from this Leith Yard, special mention may be made of the 23 powerful screw tugs for the Alexandra Towing Co., Ltd., Liverpool, and of the many tugs and small craft for Bristol Channel ports, London, South American rivers, West African rivers, Russian ports and rivers, and other parts of the world. As well as building hulls and machinery, the firm do a large business in ship repairs of every kind; dry-docking and painting, and carrying through classification survey work, and damage repairs. Other specialities are steam whistles, syren whistles, spring buffers for steering gears and Tait's patent cargo derrick gears for economical and rapid working of general cargo.

The high class of work turned out by the firm of John Cran & Co. is well known in shipbuilding and marine circles, and we have no doubt that the new firm under the same management will still merit the name for substantial and reliable work which it inherits.

NORTH-EAST COAST DISTRICT.

(From Our Own Correspondent.)

Maritime Reconstruction.—British shipping carried 21·3 per cent. and foreign 78·7 per cent. Doubtless the same thing is going on in numerous other specialised trades, and when the British shipowner returns to pick up the strings of former connections he may find them firmly held by foreign competitors. Our maritime reconstruction will be not the least of the big problems that will need to be taken in hand with promptness and imagination.

Wireless Telegraphy.—The war has given an extraordinary impetus to the value of wireless telegraphy at sea, so much so that in the near future we may see even the very small tramp steamers equipped with it. At the last meeting of the North of England Steamship Owners' Association, in Newcastle, it was reported that the Board of Trade were taking steps to extend the Defence of the Realm Act with regard to the installation of wireless telegraphy on board ships by making it applicable to vessels of 1,000 tons and over, the previous minimum being 3,000 tons. It would seem desirable to have some elasticity in the matter of tonnage, where so valuable an auxiliary to ship equipment as wireless telegraphy is concerned, and the Association referred to has appointed Mr. R. M. Sutton, Mr. M. M. Mein, Mr. J. E. Tully and Mr. R. Dalgliesh to go fully into the question, and to consider also, among other matters, the Marconi agreement for the installation and operation of wireless apparatus.

War Profits of Shipowners.—Those who know least about the subject are probably the most prone to criticise the war-time profits of the shipowners, but it may not have occurred to them

that large reserves of capital will be needed when the great struggle is over to re-establish Britain's carrying capacity on the sea. The neutral shipowner has been the greatest gainer in this war. He has made enormous profits, out of which he has to pay no unusual taxation and excess profits duty; he has increased his fleet of merchant ships with all possible despatch, and he has cut deeply into trades which British companies developed and very largely held previous to August, 1914. At the annual meeting of the Prince Line, in Newcastle, on Saturday, Lord Furness gave a striking illustration of the encroachment of foreign tonnage. He spoke of the coffee trade between Brazil and New York and New Orleans, and said in the season of 1914 British owners carried 78·4 per cent. and foreign owners 21·6 per cent. of the shipments; whereas the position this year had been almost exactly reversed.

Transfer of Labour.—Up to the present not much progress has been made regarding the scheme recently considered by Tyne shipbuilding and engineering employers and the representatives of trade unions concerned for the transfer of labour from one yard to another in order to accelerate production. The lead in this matter was taken in August by the Shipyard Labour Department of the Admiralty, when the proposal was made that there should be a committee of masters and men with a full-time secretary, appointed by the Admiralty, and that the Admiralty superintendent of the district should act as chairman. Since then, however, there has been a feeling in favour of having as little interference from outside as possible, the belief being that if the employers and workmen met by themselves with a knowledge of the requirements of both sides and of the men available, the results would more than meet the situation. Probably, one of the most effective bodies set up since the beginning of the war for the speeding-up of output was the North-East Coast Armaments Committee, which was superseded by other machinery after the passing of the first Munitions Act. That Committee rendered excellent service, and there is a disposition with regard to the proposed new committee that it should embrace the best of the attributes of the old Armaments Committee. Further meetings between the employers and the men's representatives are likely to be held on the subject.

Committee on Production.—When the Committee on Production sits this month to review wages questions under the agreement with the shipbuilding and engineering trades entered into in the spring, whereby applications may be heard three times a year, it is likely to hear a surprising request from the skilled trades. It is understood that the semi-skilled unions will ask for an advance of 10s. per week, but the boilermakers and kindred organisations are, it is understood, going to ask for an advance equal to the increased cost of living since the war began. The cost of living has gone up, it has been officially stated, 80 per cent., so that it is easy to see that the claim of the men will be the highest that has yet been put before the Committee on Production. In June the workmen in the shipbuilding and engineering industries applied for an advance of 10s., and they received an increase of 3s. per week all round, and this, with previous concessions, brought the advances up to 15s. per week. There was dissatisfaction that only 3s. should have been conceded on the last occasion, and this may have had something to do with the present disposition to put in a claim based on nothing less than the increased cost of living. The insistent demands of labour for still higher and higher wages are not calculated to help the country to win through a long and costly war. Soldiers at the front have borne all the perils for 1s. a day, and would be only too glad to change places with the shipyard artisan, who can very comfortably make his pound a day, and more.

Abolition of Leaving Certificates.—On October 15 the abolition of leaving certificates at controlled works will come into effect, and on the North-East Coast the announcement has been received by the men with every satisfaction. Popular forecast may not be entirely verified, but there is a pretty general opinion in this neighbourhood that the restitution of freedom to the worker to place his labour when and where it may be most advantageous to him will result in little or no dislocation of industry. It is recognised, of course, that men who are now working a long way from their homes will be desirous of returning to them, but, in the main, the consequence of this will be merely an exchange of labour, and certain benefits will accrue to the country in the saving of subsistence allowances. Locally, it is not expected that many changes will occur, although it is conceivable that in the new circumstances men will be anxious to travel as little as possible. This also may in the long run give beneficial results, as there will be a saving in travelling time, with more rest for the workmen, this tending to render them more fit to perform what is required of them. One of the questions bearing upon industrial efficiency that will need to be considered after the war is the provision of more canteens in connection with the large works, whereby workmen may obtain cheap and nourishing meals in place of the cold "bait" which is put up for them, when they live far from work, the night before, and has to serve two meals in the working day. This kind of feeding cannot be good for a man, nor help to get the highest standard of efficiency as a producer.

MERSEY DISTRICT.

(From Our Own Correspondent.)

Pilotage Rates and Charges.—The Mersey Docks and Harbour Board also make known the fact that subject to the approval of the Board of Trade, they propose making a further increase in the Mersey pilotage rates and charges. The increase of 7½ per cent. authorised in June, 1916, is to be substituted by 33⅓ per cent. on the published rates of pilotage and pilotage charges.

New Voters' List.—The new voters' list of Mersey Dock electors has just been revised by Mr. W. H. S. Oulton, the Liverpool Revising Barrister, and as now signed contains 2,992 dock electors, which is 150 less than last year. The revision was attended by Sir Helenus Robertson (Chairman of the Board), Mr. W. C. Thorne (Solicitor), and Mr. Alfred Chandler (General Manager and Secretary).

Manx Holiday Season.—Despite the war the Manx holiday season has this year been maintained, though with only four steamers that remain under the control of the Isle of Man Steam Packet Company. These four vessels have made 581 trips, covering a distance of 40,596 miles, a decrease of 20 trips and 2,692 miles compared with last year, or of 1,850 trips and 137,362 miles in the season 1913 which was not affected by war. Of the 581 trips made this season, 375 have been made between Douglas and Liverpool.

Honours for Pacific Steam Navigation Company's Officers.—Since the outbreak of war no fewer than seven officers of the Pacific Steam Navigation Company have been awarded either the Distinguished Service Order, the Distinguished Service Cross, or the Distinguished Service Medal. In this connection it may be added that Captain W. H. Kelly, formerly chief officer of this company's steamer *Orcoma*, has just been awarded the D.S.O. and given the rating of Commander in the Royal Navy.

Association of Shipbuilding Draughtsmen.—Mr. J. D. Murray, president of the Merseyside branch of the Association of Engineering and Shipbuilding Draughtsmen, at Birkenhead on Saturday, stated that since the beginning of the present year the membership of the association had doubled and was now close upon 10,000 strong. He further observed that the Association did not desire to adopt an aggressive policy, but they were determined to see that their interests were respected. Strikes and restrictions of output formed no part of their present programme, but it must be recognised that it was impossible to raise the status of the profession on their present inadequate remuneration.

Increase in Port Charges.—The Mersey Docks and Harbour Board have decided upon another increase in the port charges, the tonnage rates, and dock and town dues being affected this time. The published rates of these have already been increased by 25 per cent. and it is now proposed that from November 1 the schedule of tonnage rates on ships and dock rates and town dues on goods shall be plus 50 per cent. instead of plus 25 per cent., which represents a net increase of 20 per cent. on the present charges. In the shorter voyage classes where the rates are already within 20 per cent. of the statutory limit, and on which they cannot put the full 20 per cent. now proposed, these will be put up to their statutory limit. The explanation given for this further increase is the enormous increase in the cost of labour, of coal and other materials, and the substantial increase in interest on capital. It is further pointed out that as the Board provide no dividends, the revenue collected is required solely to meet current expenditure.

SOUTH WALES DISTRICT.

(From Our Own Correspondent.)

Dock Pilots' War Bonus.—An application was made to the Cardiff & Bristol Channel Shipowners' Association by the Dock Wharf, Riverside and General Workers' Union for an advance of

12½ per cent. in the war bonus granted to the Barry Dock pilots and licensed boatmen. The case was submitted to the Committee on Production who have now decided that as from the beginning of the first full pay following September 19, the men concerned shall receive an advance of 12½ per cent. on their tariff rates. This advance is to be regarded as war wages and recognised as due to, and dependent upon, the existence of the abnormal conditions prevailing in consequence of the war. The war bonus is now brought up to 37½ per cent.

British and Foreign Sailors' Society.—An interesting ceremony took place at Cardiff on September 26, when Lady Jellicoe, wife of the First Sea Lord of the Admiralty, took part in the functions attending the transference of the John Cory Sailors' and Soldiers' Rest to the British & Foreign Sailors' Society. Her ladyship received an enthusiastic reception from Dockmen at the Exchange, and in the course of a brief speech thanked the Shipowners of Cardiff for the splendid response they had given to the recent appeal on behalf of the Lifeboat Institution, and appealed to them for their support in the case of the Sailors' Rest. It is contemplated providing a dormitory for 60 sailors at a cost of about £6,000, of which about £1,500 is already in hand. The Society has succoured 15,000 members of the crews of vessels attacked by German submarines, and the expenses in looking after interned in Germany and Austria amount to £500 per week.

State Treatment of Shipowners.—At a meeting of the Swansea Chamber of Commerce on Friday a letter was read from the Cardiff Chamber asking support for the following resolution:—"That this Chamber, the majority of whose members are not shipowners, protests against the unfair and one-sided treatment of British shipowners by the Government." The letter went on to refer to the immense profits of neutral shipowners, who would be able to compete after the war with British owners. The President (Mr. E. P. Jones) said the letter was laconic to a fault. The Chamber would be better able to consider the question if it had indicated in what direction the Cardiff Chamber were of opinion that unfair and one-sided treatment had been meted out. He thought they might take it for granted that the complaint was against the action of the Government in the matter of the Franchise Bill, where they introduced for the first time, differentiation between shipowners and other trades in the application of excess profits. This question came before the Swansea Chamber last June, when a resolution was passed to the effect that the Chamber strongly objected to the principle of trade differentiation in taxation and asked the support of other Chambers. Mr. Sam Stephens said the Food Controller and the other Government officials had shown very clearly that the prices of commodities had not risen because of excessive freightage rates. British shipowners had been bound to raise their freights to follow suit with the neutral who had done so earlier in the war. He was not a shipowner, and could therefore view the matter from an impersonal standpoint. After a great deal of discussion the Chamber passed a resolution giving support to the Cardiff resolutions.

BELFAST DISTRICT.

(From Our Own Correspondent.)

Rates to Scotland.—It has been decided to further increase the rates for merchandise traffic between stations and ports on the Irish railways, and stations, ports and places in Scotland, *via* all routes by 6d. per ton, in respect of transhipment services at the Irish ports on through rates, and 6d. per ton additional in respect of cartage in Ireland on rates noted as the new rates will come into force on November 1, inclusive of cartage service in Ireland.

Wages Questions.—Wages questions are likely to come to the front again in Belfast before the end of the year. The Vigilance Committee of the A.S.E. has passed resolutions demanding (1) a reduction of 50 per cent. in the price of the necessities of life, or an equivalent rise in wages; (2) in the event of no immediate effect following this demand that a vote be taken at once to authorise drastic steps being taken to enforce these demands.

The following resolution has also been passed:—"This meeting views with alarm the conditions in engineering shops, and resolves to join up with other districts demanding a shorter working day and week; and we also resolve to form an organisation to resist reactionary regulations and restore trade union conditions after the war. We resolve to fall in line with the rank and file movements in the United Kingdom, and cordially invite the co-operation of all organised workers in the engineering and shipbuilding trades."

A strike of plumbers in one of the local yards a few days ago did not refer to wages, but to grievances against a foreman. The draughtsmen are also anxious for a further advance in wages, and held a meeting on the subject last week.

THE FREIGHT MARKETS.

(From Our Own Correspondents.)

London.—Chartering business on the Baltic Exchange is without any new feature, though rates are steadily maintained at values which have now been current for some time. The pressure for available carrying space is also sustained, especially from the North American Atlantic seaboard ports as well as from the East. From the River Plate there is nothing doing, and rates continue nominal at 145s. from the up-river ports and 5s. less for down-river loading. From the Range neutral tonnage can obtain 200s. on net form to the United Kingdom, 250s. to the French Bay ports and 325s. to West Italy, while for Gulf loading an additional 30s. is forthcoming. The rate for heavy grain remains unchanged at 30s. from the Northern Range to the United Kingdom and 25s. for oats. Virginia coal charterers are seeking tonnage for coal cargoes to South America, and are willing to concede 125s. to the Plate, $32 Rio de Janeiro and $34 Santos. Profitable business offers for the carriage of sugar from Cuba to France or Italy. Nitrate business offers at 185s. to the United Kingdom or 200s. Italy. The Eastern section of the market is still very bare of tonnage, and very high prices can be commanded by owners fortunate enough to have vessels which they can place in the Eastern trade. From Karachi 250s. continues to be indicated on scale basis to the United Kingdom, and the same figure is offered from Bombay on deadweight. From Bombay to the Mediterranean on deadweight 400s. can be had. From the Madras coast 500s. still offers for kernels to Marseilles. The rice ports are badly in need of tonnage, and no doubt a substantial advance on the current quotations of 500s. from Burmah or Saigon to this country or France. Steady business is being done in chartering from the Mediterranean ore and phosphate ports at rates which are on the basis of 45s. Huelva to the Mersey, 50 fr. Bilbao to Boulogne, 50s. Bougie to the Clyde, 65s. Tunis to the Clyde, 75s. Sfax to the east coast of the United Kingdom and 60s., pyrites, Huelva to the east coast of the United Kingdom. Bay rates are without alteration.

Glasgow.—The situation on the Glasgow market is unchanged so far as the tonnage scarcity is concerned. During the week business has been of a hand-to-mouth description, and many destinations outside the controlled trades have been forced to remain idle for lack of boats. France and Italy secured some tonnage at full schedule rates. Swansea to Bilbao fixed at 150s. fuel. There was a good demand in the homeward markets, but apart from a few fixtures in the American trade there was very little of interest outside of business done under the Government control scheme. The following fixtures were reported:—Northern Range to the United Kingdom, 225s., September-October; States to nitrate ports, about 73s., coal, October-November. The East was indifferent, there being practically no offers of tonnage.

Newcastle-on-Tyne.—The feature of the market this week has been the large number of fixtures for Swedish ports, in connection, presumably, with the contracts for the supply of steam coals entered into by the Swedish State Railways Department. Thus, Gothenburg has been arranged for in respect of six vessels:—2,500, 200 kr.; 800, 185 kr.; 2,000, 2,100 and 2,700, 190 kr.; and 2,400, 195 kr.; whilst Stockholm has been done, for a 2,700-tonner, at the old rate of 207½ kr. It will be observed that the Gothenburg rates show considerable variation and that the tendency is undoubtedly easier. Another very interesting fixture is that of a 2,700-ton vessel for Rotterdam at 95s. It is difficult to compare this with a previous fixture for that port, inasmuch as no vessel for Rotterdam discharge has been engaged for many months—not since the latter part of 1914, indeed, if memory serves. Business for other directions has been done on exceedingly attenuated lines, only North French ports successfully engaging attention at the scheduled rates. There is no lack of inquiry for most neutral directions, however, and rates on offer continue to be very high. Coasting business is offered at from 20s. to 21s. to London. Portugal continues listed at about 90s. to Lisbon and 100s. to Oporto. Gibraltar is mentioned at 97s. 6d. The Spanish Mediterranean is represented by 210s. to Barcelona. Port Said is steady at 165s.

Liverpool. Outward freights continue firm to all destinations. The inquiry is keen, but transactions are few owing to very little tonnage offering. Very tempting figures are offering to neutrals in all trades, and one such boat of 1,600 tons d.w., Cardiff to Rouen, made 48s. 9d. Time charters are likewise firm, and 45s. paid for one round trip in the States and West Coast South American trade, October. In the homeward trades, Eastern markets are still unable to get free tonnage, though 400s. d.w. is offering Bombay to Mediterranean, 500s. Madras to Marseilles, and 550s. to 600s. Saigon to France. North America continues a good market for net charters, and 225s. is indicated from Range ports to the United Kingdom and 250s. to French Atlantic. Ships, however, are offering very sparingly. Berth cotton quotes 5 c. per lb. from New York to Liverpool. Grain is workable at 30s. Range ports to the United Kingdom. River Plate quiet, but firm, on basis of 145s. from up-river ports. Mediterranean ore ports have a brisk demand at firm rates, and some fixtures are reported at Spanish Mediterranean ports to West Britain with onions at 17s. per case.

Cardiff and Swansea.—There has been a little more activity on the market, tonnage being in rather better supply. Business for French destinations has been very brisk. An active inquiry has been in evidence for neutral ports, consequently rates were firmly maintained. Spanish rates quoted were on the basis of 160s. for Bilbao and between 220s. and 230s. for Barcelona. Fixtures reported for France were :—Havre, 45s. 9d. (neutral); Caen, 48s. (neutral); Honfleur, 48s. (neutral); Rouen, 25s. 3d., fuel, and twice at 26s. 3d., fuel (allied), four times at 48s. 9d., 49s. 6d., fuel, and 74s. 3d.; coke (neutral); Bordeaux, 34s. (allied). Two small sailing vessels were fixed for Granville at 100s. for Cardiff and Newport loading. On the Swansea market chartering has been practically confined to the French ports at schedule rates. Conditions, generally, being without alteration. The inquiry has been brisk, but business is entirely dependent on the tonnage position. For neutral ports very strong rates have ruled. Fixtures reported were :—Irvine, 16s. 6d.; Dublin, 19s.; Rouen, 51s., fuel (neutral) and 48s. 9d. (neutral), for Briton Ferry loading; Tonnay Charente, 63s. (neutral).

Hull.—The market continues to have a plentiful inquiry all round, but there is an inadequacy of carrying tonnage, which has the effect of retarding a large proportion of business which would otherwise be done. Nevertheless a fairly active business is passing for the North French ports, some of which is in sail and the majority in steam tonnage. The west Italian inquiry is strong, but chartering operations are curtailed for lack of sufficient suitable tonnage. The neutral markets are full of inquiry, but very little business is permissible so far as they are concerned.

THE COAL MARKETS.

(From Our Own Correspondent.)

The coal markets of the country are generally firm in tone with the exception perhaps of South Wales where the demand is not pressing and rather more fuel is being produced than can conveniently be got rid of. There is still a good deal of trouble being experienced in the matter of transport, both on sea and land. With that overcome there would be no hindrance to a considerable expansion in the coal trade, and there is little doubt that the collieries could respond to any call likely to be made upon them.

A good many inquiries are circulating in the markets at the coal exporting ports, and some new business has been put through, though the amount has not been very large owing to the transport difficulties which makes operators very cautious. Meantime a considerable amount of coal is being disposed of on contract account, and the authorities are making large demands on the colliery outputs.

The bunker coal trade on the North-East coast has been rather brisker in consequence of the better movement of shipping. At the same time there are large quantities of good bunkers waiting to be moved and therefore the collieries are under no pressure for immediate supplies. The prospects generally are rather better and therefore the tone of the bunker coal section of the market has improved, though prices are without change. There is plenty of coal for disposal at 24s. to 25s. for best bunkers, 24s. for ordinaries, and special bunkers for export are worth 30s.

The South Wales markets are not so firm in tone with regard to bunker fuel as the markets of the North-East coast. Indeed the position is rather unsatisfactory. There is a good deal more bunker coal at the pits than is likely to be cleared even if the demand should improve very considerably, and consequently the collieries would be glad to find an outlet for the excessive supply of fuel. But for the fixed prices values would undoubtedly drop. As it is they remain at 23s. for best bunkers and 21s 6d. for ordinaries.

The North-East coast coal markets have been experiencing a period of comparative animation, the volume of shipping arriving has been fairly considerable and supplies of all classes of coal have moved off briskly. The tone of the markets is firm and even optimistic as inquiries are numerous and there seems a good prospect of the better state of affairs continuing for some time, though how long it is difficult to say. Transactions have been pretty numerous, amongst them being the allocation of contracts by the War Office for 120,000 tons of best steam coal with the leading collieries of Northumberland and Yorkshire. The destination of this fuel is understood to be Woolwich. It is to be delivered over the ensuing half-year and the maximum official prices will be paid.

A good contract for 18,000 tons of Northumberland and Durham best steam coal has also been placed by the Norwegian State Railways Department, the price fixed being 5 per cent. over schedule values, delivery during November and December.

All classes of steam coal are being taken up freely, but gas coals are moving off rather irregularly and the demand for house coal is for the time being rather small.

Approximate quotations are :—Best best steams, large, 30s., and smalls, 18s 6d. to 20s.; Tyne primes 29s. 6d. to 30s., and smalls 18s. 6d. to 20s. 6d.; Second steams 25s. 6d. to 27s. and smalls 18s. 6d. to 20s.; unscreened steams 24s. to 25s.: North Northumberland steams 28s. and smalls 20s.; smithies 25s. to 30s.; nuts 30s.; best Durham gas coals 25s. and seconds 23s. 6d.; coking coals 17s. to 25s.; house coal 24s. to 25s.: best bunkers 24s. to 25s., ordinaries 24s., and specials 30s.; foundry coke 42s. 6d. and blast furnace coke 28s.

There has been no change for the better in the position of the South Wales coal markets. Transactions are mostly conspicuous by their absence and the tone of the market is listless. There are large stocks of coals at the pits and these are offered freely, but purchasers are few and inconsiderable. The collieries in many instances have had to resort to short time as a check upon increasing stocks unduly.

Values are for best Admiralty large coal, 33s.; seconds, 30s. 9d. to 31s. 6d.; and ordinaries, 30s.; drys, 28s. 6d. to 30s.; best bunkers, 23s.; and ordinaries, 21s. 6d.; washed smalls, 22s. 6d.; best large Black Veins, 30s.; Western Valleys, 29s.; Eastern Valleys, 28s. to 29s.; nuts, 28s. 6d. to 30s.; Duff, 14s. to 18s.; house coal, 30s. 9d. to 33s.; No. 3 Rhonddas, large, 30s. 9d., and smalls, 26s.; No. 2 Rhonddas, large, 27s., and smalls, 20s.; patent fuel, 30s.

The Hull coal market, unlike the markets of the North-East coast and South Wales, continues to suffer from a deficiency of supply. Great demands are made on the Hull market for supplies by the authorities, and large quantities are booked to be sent overseas to our Allies. The inland demand, too, is very considerable, and consequently practically all the fuel coming forward is earmarked before it arrives at its destination. If there is any quantity of free coal over and above the official requirements it is mostly taken on Government account. Private operators, therefore, have the greatest difficulty in securing enough fuel to meet the needs, and prices are maintained very firmly.

The Scotch markets are practically without alteration. There is little export trade, but the home demand continues very good. This is especially the case in the West of Scotland, where manufacturers' requirements are very considerable. The outputs of the collieries are taken up pretty well, but they would be able to provide much more coal if the means of distribution were better. In Fifeshire and the Lothians operators look for an improvement in business when the reorganisation scheme for coal transport gets into working operation.

Prices are for splints, 28s. to 30s.; Hartley's, 29s.; Ells, 26s. 6d. to 28s.; navigations, screened, 28s. to 39s., unscreened, 23s. 6d. to 25s.; and steams, 27s. 6d.

On the Liverpool coal market the demand for Lancashire steam coal is steadily maintained. There are plenty of inquiries for coal for export to Allied destinations. All the production from the Yorkshire and Derbyshire collieries that comes on the market is freely disposed of, and as the quantity of coal coming to hand is not large the demand is unsatisfied and inferior classes of fuel are taken into service. On account of the busy movement of shipping in the port, bunkers are freely taken up and the collieries are unable fully to meet the demand.

The Midland coal markets are without change. There is pressure in every direction for immediate supplies, this remark applying especially to all brands of steam coal. Many orders are received which the collieries find themselves unable to fulfil, and consequently operations are more or less limited to contract obligations, though even these in many cases are in arrear.

The quantity of coal which finds its way to the London coal market is small, but as the demands of consumers of house coal are now nearly satisfied, the pressure has eased and merchants are not so much concerned with the short supplies. Steam coal is very much in demand and odd lots of this class of fuel are eagerly snapped up. The amount of business passing has not been large.

COMPANY MEETINGS.

Prince Line, Ltd.—The twenty-third ordinary general meeting was held at Newcastle-on-Tyne, on September 29. The Right Hon. Lord Furness (chairman), in moving the adoption of the report and accounts, said he did not think the accounts called for any detailed comment. The profit for the year, after making the necessary provisions for taxation, &c., amounted to £430,817, as against £495,328 last year, which showed a difference of some £64,500. Several factors had contributed to this decrease. In the first place, the increase from 60 per cent. to 80 per cent. in the excess profits duty took effect on January 1 this year, consequently six months of the company's trading, to June 30, was subject to the increased taxation. In the second place, the Government scheme for liner requisition came into force in March last, so that their steamers had from time to time automatically come under the scheme during the last three months of the financial year, with a consequent reduction in earnings. Further, there were heavy and increasing working expenses, cost of upkeep, and war risk insurances. They proposed to pay the same dividend as last year—30 per cent. An interim dividend of 5 per cent. was distributed in March last, and a final dividend of 25 per cent. would be posted to the shareholders within the next few days. He regretted to say that the four 10,000-ton steamers building, referred to by the late chairman at the last meeting, had not yet been delivered, the work having been retarded by Government demands on the builders and by shortage of labour. In the course of the year they had contracted for two further steamers to be built, and they had also purchased the *Mongolian Prince*. Since the close of the financial year they had also acquired the *Siberian Prince*, a sister ship. One of the principal functions of the Ministry of Shipping was to divert vessels from such lines as were not directly trading with this country, and place them in trades where they could directly serve the needs of Great Britain and the Allies. These channels of trade had been secured for British shipping by private enterprise and many years of individual toil, and there was no doubt that before the war they afforded a considerable source of revenue for this country. For that reason it was of paramount importance that the British owner should be placed in such a position that he, at least, would have a reasonable prospect of regaining those trades when he once again had the surplus tonnage to engage in them. The Prince Line was more vulnerable in the matter than most shipping companies, as a large proportion of their fleet was engaged in far distant lines, and practically the whole of their tonnage so engaged had now been diverted. The shortage of tonnage caused by the withdrawal of the Prince Line and other steamers had been made good by an influx of foreign tonnage, earning enormous freights and putting its owners in a very strong financial position. There was a real danger that after the war the Prince Line and other companies similarly situated, having been subjected to heavy taxation, and having had their source of profit limited to a narrow margin, would find those foreign competitors so securely established that it would be beyond their power to dislodge them. The past management of the company with great foresight had inaugurated a fund for the protection of their trades. It could not, however, have foreseen a menace as extensive as the one now before them, and their first duty was to augment that fund as far as it lay in their power. They proposed setting aside the sum of £250,000 to the fund, bringing it to a total of £700,000. They were supplementing the amounts allowed by the war risks associations, in respect to pensions payable to dependants. He offered a tribute to the loyalty and patriotism of the captains, officers, and crews of their steamers, who throughout the war had served the nation unflinchingly, and with great skill and courage. He also desired to place on record their appreciation of those members of the staff with the Forces, and also for the way in which the remainder of them had met the increased pressure of work, owing to the depletion in numbers.

Mr. F. W. Lewis, in seconding the motion, said the chairman's remarks, coupled with the directors' report, had dealt fully with the accounts for the past year, and he did not think it was necessary to add anything thereto. He thought the accounts might be regarded as very satisfactory, but they could not look forward to anything like the same results being achieved during the current year. The fortunes of war were probably recoiling upon the Prince Line to a greater extent than upon the majority of shipowners, but nowadays particularly a broad-minded spirit is essential. As business men, they must do everything within their power to protect the interests entrusted to their care. One of the most valuable assets of the company was its regular trades between distant ports—an asset of national as well as commercial value—and whilst their vessels were being diverted into other routes of greater urgency from the national point of view, they must keep as tight a grip as possible upon those trades. hence the need for strengthening the company's reserve. Although the present outlook was not by any means encouraging, they were determined there should be no halt in the progress of the Prince Line. The devotion to duty by the *personnel* of fleet and also the shore staffs had been a source of great pride to the directors. Unfortunately this devotion to duty had brought great sacrifices in its wake, particularly in the case of the *Belgian Prince*. The crew of that vessel were deliberately deprived of the means of saving themselves, no less than 39 men having been drowned when they could more easily have been saved. He asked the shareholders to join with the directors in expressing their deep sympathy with the relatives of all those men who had lost their lives whilst employed in keeping the Red Ensign flying where Britain's seamen were determined it always should fly.

The resolution was carried.

John Brown & Co., Ltd.—The annual meeting was held on September 27.—Lord Aberconway (the chairman) in moving the adoption of the report and balance-sheet, said he was afraid that owing to the fact that the war is continuing he would not be able to give the shareholders more information about the affairs of the company than he was able to give a year ago, when he reminded them that the whole of the operations of their great concern and its allied concerns were being undertaken for the benefit of Government for the production of supplies necessary to carry on the war. The output of the company and its allied concerns was perfectly amazing. When the war was over probably they would be able to give the shareholders a more detailed idea of the great operations that had been most successfully conducted. With regard to the Sheffield works, there had been no slackening of effort either on the part of officials or men. He would like to say how they fully recognised the arduous work the men were doing and had done, often under exacting conditions, and with the necessary change of trade union regulations that had prevailed during many years. The directors, officials and workmen had really done their best. Meanwhile the directors got no increased dividend. Other people got bonuses, some got increases of salary, but the dividend of the John Brown shareholders nominally remained the same, but was relatively less in value than before. They all felt that to make profit out of the war was repugnant to their feelings. They were hoping to be able to pay the excess profits tax and the munitions levy, and the officials of the company had cheerfully fallen in with the very intricate restrictions upon profits which the Government had properly enforced. The company had always tried to give the country the benefit of their capital and resources on the most favourable terms. They felt that they must not think of spending any revenue on increased dividends until the war was over. They had got to retain the company's earning power to the fullest capacity, and that could only be done by judicious handling of the reserves. They had to think of the future and consider themselves as a great national arsenal that required the greatest skill in its direction. If they took the nation as a whole, our main output in production had increased to 30 per cent. over normal times, with 30 per cent. male population to do it. But for the valuable help women have given, such figures would have been impossible. With regard to coal, the country was producing within 10 per cent. of its pre-war production, although many miners had gone to the front. Although they all regretted that in many cases the miners were not working all their time, the output per man was greater than before the war. Pig iron output had increased enormously and they were turning out 20 per cent. more steel than the pre-war standard. They were preparing for a very large steel and shipbuilding output. They had doubled and trebled the shipbuilding facilities, and he was

quite certain that this would become almost the dominant trade after the war, and from this the shareholders of John Brown & Co. would reap the benefit. Although the balance-sheet was much the same as a year ago, they had had to consider the future. The carry-forward had increased by £29,000. If they took the two sides of the balance-sheet they would find the balance was in favour of the assets, as compared with last year. He would remind them that, like most other firms in the Sheffield district, the balance-sheet by no means represented the actual value in properties, owing to the changing conditions in the iron and steel trades, which made it almost impossible to compute the value of their actual plant. They were contemplating moving some of their minor branches to other sites convenient for administration from Sheffield. The departments for heavy castings and forgings had been largely increased and must be developed to meet the increased demands of the shipyards. They found that their space in Sheffield was too limited for this. Their shipbuilding companies had all done well, thanks to the great services rendered by Lord Pirrie. As to Coventry, great things had been done, the old debit balance had been entirely written off, resources had been created to meet post-war conditions, and the output of munitions was simply enormous. The firm and its allied concerns had in their employ between 70,000 and 80,000 men, women and boys, and great improvements were being made in the conditions under which they worked. In return, the firm hoped they would play the game and continue to produce the munitions for our soldiers suffering and dying at the Front.

The resolution was seconded by Mr. Bernard A. Firth and adopted.

Dundalk & Newry Steam Packet Co., Ltd.—The half-yearly meeting was held at Newry on September 26. The chairman (Mr. T. C. Macardle, D.L., J.P.), in moving the adoption of the report and accounts said that during the last half-year they had worked under very considerable difficulties. Expenditure during the half-year was within £628 of the corresponding period last year, and yet revenue showed a decrease of £3,066. While they were unable to effect any substantial economies in working, their trade was very badly affected by reason of the general shrinkage of imports and exports, which again were very profoundly affected by the decision of the Government not to allow the export of potatoes, and from Newry this traffic was their staple trade in normal years from November to June. In order to save the situation as well as possible they had to cut down their Newry services, and by chartering a steamer to Messrs. G. & J. Burns they were able to somewhat retrieve the situation. The largest item in their expenditure was that for insurance against war risks. It will be seen that the expenditure this half-year had been the large sum of £4,458, and was £3,133 in excess of the corresponding period last year. The expenditure under this head had been their principal trouble, but the Government had now made such different arrangements that their liability was now placed on a much better footing. Had it not been for this relief, coupled with the further relief they were bound to get from the advances in freight authorised by the Government, and which came into operation on September 17, they would have felt very chary of even paying a dividend for the half-year ended July 31, and they could now only hope that, with the concessions obtained under the two headings mentioned, they might be able to show a moderately good result in respect of the half-year in which they were now working.

Mr. J. M. Cox seconded the resolution, which was carried.

COMPANY REPORTS AND DIVIDENDS.

General Steam Navigation Co., Ltd.—It is announced that dividend warrants for an interim dividend of 5 per cent. on the ordinary shares will be posted on October 10.

Clan Line Steamers, Ltd.—Interim dividend of 20s. per share, free of tax (10 per cent. actual), on ordinary shares, payable on October 12. A year ago the dividend was 12½ per cent.

Tempus Shipping Company, Ltd.—The directors have declared an interim dividend for the half-year ended June 30, of 5 per cent., free of income-tax. Last year the interim distribution was 10 per cent.

Union-Castle Mail Steamship Company, Ltd.—The directors have declared an interim dividend for the half-year ended June 30 last, at the rate of 6 per cent. per annum (free of income-tax) on the ordinary stock of the company.

Port Talbot Graving Dock & Shipbuilding Company, Ltd.—The profits for the year ended July 31 last, after due reservations for excess profits duty, munitions levy and income-tax, and after providing for interest on debentures, amount to £5,226, and after adding thereto the balance brought forward from last year's accounts and deducting therefrom interim dividend paid, there remains to be dealt with the sum of £7,746. It is proposed to pay a final dividend of 5 per cent., free of tax, on the ordinary shares and to carry the balance forward.

Dundalk & Newry Steam Packet Co., Ltd.—The report of the directors shows that the gross revenue amounts to £39,262 and the expenditure £35,775, showing a gain of £3,487. To this was added the amount brought forward from last half-year, £1,657, making in all £5,144. Out of this sum there has been transferred to reserve fund £2,000, and a dividend of 3s. per share, less income-tax, is recommended, which will absorb £1,586, plus a bonus of 1s. per share, free of tax, £705, making a total of £4,291, leaving £853 to be carried forward.

Palmers Shipbuilding & Iron Company, Ltd.—The report of the directors states that the profits for the year were £63,255 after making provision for depreciation. Debenture and other interest amounted to £29,502, leaving £33,754 net profit for the year, which sum, in addition to £42,772 already standing to credit of profit and loss, making altogether £76,526, the directors propose to carry forward. In accordance with the agreement entered into with the debenture trustees, and the prior lien debenture holders, no dividend upon either preference or ordinary shares can be paid until the prior lien debentures are discharged.

West Hartlepool Steam Navigation Company, Ltd.—The report for the year ended March 31 last states the profit amounted to £304,439, which, added to £12,912, brought forward, makes a total of £317,361, and, after charging classification expenses and repairs not recoverable from underwriters, there remains a balance of £302,099. Out of the net earnings—after making provision for income-tax and excess profits duty, amounting to £140,000, reserving for postponed repairs £25,000, and paying the preference dividend for the year to December 31 last, and a dividend of 10 per cent. per annum on the ordinary shares—there has been transferred for depreciation, £16,439; to reserve, £25,000; and to insurance fund reserve, £25,000; a balance of £22,587 being carried forward.

COMPANY REGISTRATIONS.

Bristol Ship & Steamship Brokers, Ltd.—Capital, £1,000, in £1 shares. Objects, shipowners, ship and insurance agents and brokers, underwriters, general agents, traders, transport and forwarding agents, carriers by land and water, &c. Signatories :—

Miss M. G. Paige, 12, Briscoe Buildings, Brixton Hill, S.W. 8.
O. S. Bartlett, 46, Nine Elms Lane, S.W. 8, solicitor's clerk.

The first directors are to be appointed by the subscribers. Registered office : Caxton House, Tothill Street, S.W. Private company.

Thompson, Lewis & Howie, Ltd.—Capital, £500, in £1 shares. Objects, to take over the business of a naval architect, consulting engineer, and ship, marine and cargo surveyor, carried on by W. Lewis, at 5, Billiter Street, E.C., as "Thompson and Lewis." Signatories : —

W. Lewis, 5, Billiter Street, E.C., naval architect.
F. G. L. Moir, the Gatehouse, Sanderstead, Surrey, naval architect.

The first directors are W. Lewis, J. Howie and F. G. L. Moir. Private company.

Roland & Company, Ltd.—Capital, £5,000, in £1 shares. Objects, flour factors, corn merchants, charterers of ships and vessels, forwarding agents, contractors, wharfingers, &c. Signatories :—

A. B. Bryden, 108A, Cannon Street, E.C. 4, chartered accountant.
C. A. Limbert, 1, Leadenhall Street, E.C. 3, insurance broker.

The first directors are C. A. W. Limbert and A. B. Bryden. Registered office : Cross Lane, E.C.3. Private company.

John Hall, Junr., & Co., Ltd.—Capital, £100,000, in £1 shares. Objects, shipowners, ship builders, ship insurance, passenger and general brokers, managers of shipping and other property, ships' store dealers, dock owners, ship repairers, freight and general contractors, merchants, carriers by land and sea, &c. Signatories :—

J. A. Fuller, 25, Brampton Road, Harringay, N. 15, clerk.
F. H. Riches, 18, Bromar Road, Denmark Park, S.E. 5, clerk.

The first directors are to be appointed by the subscribers. Qualification, £100. Remuneration as fixed by the company. Solicitors, Ashurst Morris, Crisp & Co., 17, Throgmorton Avenue, E.C. Private company.

NEWS PARAGRAPHS.

Aged Merchant Seamen.—The first list of subscriptions for the endowment of a Tyne Ward in the Royal Alfred Aged Merchant Seamen's Institution, Belvedere, Kent, amounts to £2,408 13s. 6d.

Offices of Gray, Dawes & Co.—On September 24 this firm removed to their new offices at 122, Leadenhall Street, London, E.C. 3, to which address all communications should now be addressed.

Mersey Harbour Dues.—The Mersey Docks and Harbour Board have adopted a recommendation to increase their tonnage rates on ships and dock rates, and town dues on goods. The increase works out at a net increase of 20 per cent. on their present charges.

High Price of German Shares.—The Dresden Borse announces that the price of most shares has reached "an extraordinarily high level" as a result of continued buying by the public for months past. In some cases the rise has been such that the Borse considers it necessary to warn the public against the perils of inflation.

Indian as Fourth Engineer.—The *Pioneer Mail* (India) states that Mr. Surendra Nath Majumdar, a Calcutta man, has written to a Calcutta paper, from London, saying that he has been appointed fourth engineer of the steamship *Merchant Prince*. He claims to be the first Indian to obtain such an appointment in a British line.

Steamers Offered by Auction.—On September 26, C. W. Kellock & Co., at the Baltic Mercantile and Shipping Exchange, conducted a sale of ships by auction, the steamers *Streatham*, 1,207 tons gross, and *Quenast*, 569 tons gross, being submitted for competition. The vessels received good attention, but a sale did not result in either case, the *Streatham* being withdrawn at £45,000 and the *Quenast* at £20,500.

More Orders for Steel Ships.—*The Times* New York correspondent states that the Emergency Fleet Corporation has contracted for 40 fabricated steel standardised ships of 9,000 tons deadweight at a basic price of $1,305,000 (£261,000) each. As in the case of both the previous contracts for fabricated steel vessels, the Government will build and own the yards. Congress is planning appropriation of $35,000,000 (£7,000,000) for the three plants.

Shipbuilding at Birmingham.—Birmingham has now added the building of ships to its many other war activities. It has been found possible to adapt existing manufacturing plants to the production of parts according to a system of standardisation, and to turn out complete craft in this way, the parts being forwarded under distinguishing numbers to the coast, and there assembled. The capacity of the vessels ranges over 500 tons. It is understood that the results achieved are such that several additional firms contemplate converting their existing resources to shipbuilding, and are seeking contracts.

Seamen to Produce Passports.—The United States Consul-General in London has received information from the Secretary of State at Washington that hereafter all seamen on vessels bound for ports in the United States should have in their possession passports or other documents showing their identity and nationality. Those not provided with proper papers will be liable to detention. Masters of all outgoing vessels will be required to make a statement in writing at the time of the granting of the bill of health setting forth that each member of the crew is in possession of a document of identification with photograph attached. This rule as to identification is practically identical with that of the British Government applicable to foreign seamen arriving in United Kingdom ports.

United States Merchant Fleet.—A Reuter message from Washington says that according to an official statement outlining the Government shipbuilding programme, the United States, in little more than a year, will have a merchant fleet of more than 1,600 ships, aggregating 9,200,000 tons, as compared with the present tonnage of 3,500,000, which includes the 700,000 tons of the German and Austrian vessels at present under operation by the United States Government. The American ships now available for oversea service number 458, with a total tonnage of 2,871,000. The Emergency Fleet Corporation has commandeered nearly 400 steel ships of over 2,500,000 total tonnage, and has contracted for 636 ships with a total tonnage of over 3,124,000. The Shipping Board has decided on a charter rate of $9·75 (39s.) per ton per month as the basis of payment for ocean-going merchant vessels which are requisitioned by the Government.

Ansaldo Company, Genoa.—The share capital is being raised again, from £1,980,000 to £3,960,000, and another £1,980,000 is being issued in debentures. This capital increase is undertaken in connection with the construction of twenty 8,000-ton cargo vessels (necessitating a considerable amount of new equipment); and for the purchase of coal pits in Aostatal, and the construction of a water-power station.

Japanese Shipbuilding.—The *Japan Advertiser* states that before the end of 1917 the shipyards of Japan expect to launch 97 steamships with an aggregate tonnage of 400,000 tons. Thirty-one merchantmen, aggregating 108,755 tons, and each of more than 500 tons, were completed in Japan during the six months ended June 30 last. Sixty-six more, representing 297,644 tons, each of more than 500 tons, will be finished before the end of this year.

Mersey Docks Warehouse Rates and Wages.—The Mersey Docks and Harbour Board have approved of two recommendations, the first to increase the war bonus and overtime wages of the employees of the warehouse department, and the second to further increase the warehouse rates and charges by adding 66 per cent. instead of 52½ per cent. It is stated that the rates were being increased in consequence of the further advance in wages and overtime.

Shipping at Durban.—In 1916 a gratifying increase was shown both in numbers and tonnages. During the year 1,551 steamers and 25 sailing vessels called, compared with 1,008 steamers and 23 sailing vessels in 1915, an increase of 543 and two respectively, a combined increase of 53 per cent. The gross and net tonnages were 7,853,333 and 4,963,708, an increase of 3,305,608 and 2,112,170 tons respectively. Of the vessels which called at Durban 1,300, 81.2 per cent., were British, and 302, 18·8 per cent., foreign. Of the foreign vessels 114, 38 per cent., belonged to Great Britain's Allies. Vessels called with cargo totalled 846, and 730 called for bunker purposes only.

Shipbuilding Developments in Canada.—The Imperial Trade Correspondent at Toronto (Mr. F. W. Field) has reported that three vessels were launched at Toronto recently, one of which was a cargo vessel of 4,300 tons, the largest yet built in Toronto yards. This vessel is 261 ft. long, 43 ft. in beam, and 28 ft. 2 ins. in moulded depth, and is equipped with triple engines of 1,400 h.p. The other two vessels will form part of a fleet of six, which are being constructed for the Canadian Government for fisheries protection work. They are 140 ft. in length, 23 ft. 6 ins. in beam, and 13 ft. 6 ins. in moulded depth. They are to be equipped with compound surface condensing engines of 500 h.p., and Howden water-tube boilers with down draught and working at 180 lb. steam pressure. They are said to be the first vessels constructed in Canada fitted with boilers of this type.

Shipping Facilities and Morocco.—According to the *Times*, the Acting British Vice-Consul at Larache (Mr. G. H. Selous) stated recently that prior to the war British trade with Morocco was seriously hampered by the inadequate shipping facilities between the United Kingdom and Morocco. This handicap was taken full advantage of by Germany, the increase of whose trade with Morocco in recent years was in great part due to the very frequent, punctual, and regular steamship service between the ports of Hamburg, Rotterdam, and Antwerp, and Morocco, which was instituted by the Oldenburg Portugiesische Dampfschiff Gesellschaft of Hamburg. If the United Kingdom is to maintain and increase its trade with Morocco, a frequent and efficient steamer service between the two countries must be established by a company which will make a point of studying and, if possible, satisfying suggestions and requests put forward by the merchants of various Moroccan ports.

Italy's Mercantile Fleet.—G. Ansaldo & Co., Genoa, one of the largest of Italy's shipbuilding companies, are making considerable extensions to their yards and works, and are increasing their share capital from £2,000,000 to £4,000,000, and in addition are issuing new debenture stock to the amount of £2,000,000. Also, the Navigazione Generale Italiana, Genoa, after declaring a dividend of 9 per cent., the legal maximum dividend in Italy, is capitalising £1,000,000 from the reserve, giving bonus shares to that amount, and also raising new capital to the amount of £800,000 for the purchase of ships. The Societa Italo-Americano di Navigazione, Turin, which recently increased its capital from £200,000 to £1,000,000, now proposes a further increase to £1,600,000. Four other companies are amalgamating, under the style of the Transociana, with a nominal capital of £4,000,000. This company will control the largest passenger and cargo boats in the Italian service.

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SINGLE DECK. Poop. Bridge. Forecastle.

ENGINES:—22″, 35″, 58′ × 39″ Stroke.

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"SHIPBUILDING AND SHIPPING RECORD" TABLE OF SHIP SALES.

Name and Type.	Tonnage.	Dimensions. Draught in ( ).	Sold by, to	Builders, hull and year.	Machinery and builders.	Remarks.
Cervo, s.v. (ex *Fratelli Bianchi,* ex *Abyssinia*)	1,154 gr. 1,033 net	186½′ × 36¼′ × 22½′	Rederiet Cervo, Sweden, to buyers not stated	O. Pittfield, St. John, N.B. (1885)	—	—
Hiawatha, s.v.	1,562 gr. 1,496 net	250½′ × 38′ × 21½′ (19′ 8″)	Acties. Henrich Biörn, Junr., Norway, to Aktieselskabet "Fido," Christianssand	A. McMillan & Son, Dumbarton (1891)	—	—
J. A. McKee, ss. (single dk.)	2,158 gr. 1,375 net	248′ × 43′ × 22½′	Algoma Steel Corpn., Ltd., Sault Sainte Marie, Ont., to the Canadian Government	Swan, Hunter & Wigham Richardson, Newcastle (1908)	20½, 33, 54 × 36 (N.E. Mar. Eng. Co., Newcastle)	—
Jessie, ss. (single dk.) (ex *Katina,* ex *Manor,* ex *Dowgate*)	2,922 gr. 1,841 net 4,700 d.w.	326¾′ × 41′ × 24½′ (22′ 3″)	Dampsk. Aktieb. "Jessie," Christiania, to buyers not stated	C. S. Swan & Hunter, Newcastle (1895)	23½, 38, 61 × 39 (N.E. Mar. Eng. Co., Newcastle)	Price about £210,000.
Margot, ss. (single dk.) (ex *Bangdal*)	1,130 gr. 673 net	226½′ × 36½′ × 15¾′	Dampskibsselsk. Nordsjöen A/S. Christiania, to Mr. F. Le Boulanger, Swansea	Moss Værft, Moss (1915) ..	16, 25, 42 × 30 (Moss Værft)	—
Petrine Hansen, ss. (ex *Nykobing*)	918 gr. 569 net 1,550 d.w.	201¼′ × 31½′ × 11¼′ (11′ 6″)	Akties. Dampskibsselsk. Thurö, Thurö, to Mr. M. Kendriksen, Copenhagen	Helsingörs Jernskibs-og-Maskinbyggeri, Elsinore (1906)	15, 24, 40 × 27 (Helsingörs Jernskibs-og-Maskinbyggeri)	Price about £85,000.
Rawson, ss. (re-named **Oregon**)	3,101 gr. 1,958 net 4,150 d.w.	325′ × 44′ × 22½′ (21′ 11″)	Cia. Argentina de Nav., Ltd., Monte Video, to Cie Générale Transatlantique, Paris	Sir J. Laing & Sons, Sunderland (1911)	25, 47, 68 × 45 (Richardsons, Westgarth & Co., Middlesbrough)	Price about £200,000.
Turret Crown, ss. (turret dk.)	1,827 gr. 1,142 net	253′ × 44′ × 19½′	Coastwise S.S. & Barge Co., Seattle, to the Clinchfield Nav. Co., New York	W. Doxford & Sons, Sunderland (1895)	21½, 36, 59 × 39 (W. Doxford & Sons)	Price about £90,000.
Vigrid, ss. (single dk.)	1,617 gr. 951 net	244½′ × 37½′ × 15¾′	Mr. A. v. d. Lippe, Tonsberg, to Mr. Harild Hanssen, Skien	Bergens Mek. Værks., Bergen (1915)	17, 26½, 46 × 30 (Bergens Mek. Værks.)	—
Viva, s.v. (iron) (ex *Steinbek,* ex *Lodestar*)	1,746 gr. 1,640 net 2,700 d.w.	259¼′ × 39¼′ × 22¾′ (21′ 3″)	J. Ripamonti, Valparaiso, to buyers not stated	W. Gray & Co., W. Hartlepool (1884)	—	Price about £52,500.

A steel single-deck steamer, building at Middlesbrough by W. Harkess & Son, Ltd., for delivery at the end of the year, to carry about 1,250 tons d.w. on 13 ft. 10 in. draught, with engines 17, 28½, 46½ by 33 in., dimensions 203′ × 33¼′ × 14′, is stated to have been sold for about £52 per ton deadweight.

A steel single-deck steamer, building by the Standard S.B. Co., Ltd., Chepstow, with engines 21½, 35, 59 × 39 in., to carry about 3,300 tons d.w., on an 18-ft. draught, dimensions 284¾′ × 41½′ × 21½′, is reported to have been sold for about £33 5s. per ton deadweight.

(*Continued from page* 334.)

Italian Ports.—A scheme for the extension and improvement of the shipping facilities at all the principal ports in Italy is now receiving the attention of the Government.

Japanese Shipping Rates.—It is reported from Tokyo that the issue of an Imperial Ordinance controlling charter rates and freight sales is imminent. There was in consequence a great fall in shipping stocks yeaterday.

Sale of German Ships.—It is reported from Rio de Janeiro that Mr. Osorio de Almeida, director-general of the Brazilian Lloyd, has addressed a letter to the newspapers contradicting the persistent rumours of negotiations for the sale of late German ships to English and North American shipping companies. He concludes his letter by energetically affirming that these ships will sail always under the Brazilian flag, employing their maximum services in the interests of the nation and of the Allied Powers.

New German Directors.—According to *Vossische Zeitung,* Geheime Regierungsrat Cuno is entering the directorate of the Hamburg-Amerika line and Geheimrat Dr. Fritsch (now at the head of the Zentraleinkaufs Gesellschaft) will take a leading position in the directorate of the Deutsche Levante line after the war.

Ships Sold by Japan.—Thirty-two merchantmen, aggregating 133,761 tons gross and 200,000 tons d.w., have been sold by Japan to England, France, Italy, America, Spain and Norway since the beginning of the war, valued approximately at 85,000,000 yen. Japan has also sold 90 trawlers to foreign countries, which are estimated at 15,000,000 yen in value. In addition to ships sold and building, Japanese owners have chartered to foreign countries—almost entirely allied countries, the exceptions being neutrals—55 merchantmen, aggregating 178,104 tons gross and 231,535 tons d.w. Japan received more than 60,000,000 yen from various foreign nations as charter rates last year.

SHIPPING SHARE MARKET.

The market in the stocks and shares of steamship companies has been stronger during the week, despite the increasing recognition by investors that profits must be considerably curtailed in comparison with these ruling during the last three years. This was made clear at the meeting of the Prince Line, Ltd., a full report of which was, for the first time, circulated widely in the newspapers for the information of shipping shareholders generally, as well as for Prince Line and Furness Withy shareholders in particular. After the meeting there was a noticeable number of inquiries for the shares of the companies concerned. Whilst there is not much movement to record in the higher-priced shares there is a rise in the price of the smaller denominations. Peninsular & Oriental deferred have changed hands at 320, and Royal Mails at 113, but for several days there were no transactions in the latter stock. On the other hand, Cairn Lines, Court Line, Khedivial Mail have been in demand with a rising market both in Newcastle and London. Royal Mail, which are, of course, controlled by the Union Castle shares, have not been dealt in as a result of the interim dividend at the rate of 6 per cent. per annum, which is the same as for the previous two years. The Clan Line dividend of 20s. per share (interim) is below the previous year's level of 25s., but the price was maintained, with a bargain between non-members marked at 30½. Sutherland Steamships maintain their price despite the reduced dividend. General Steam Navigation shares have changed hands at 22s. 9d. on the maintenance of the interim dividend at 5 per cent. In the shipbuilding group there have been numerous dealings. Swan & Hunters ordinary has been a feature with a transaction marked at 41s., which creates a new high record for the shares. Richardsons Westgarth are maintaining their increased price, and Palmers are better at 11s. There is a noticeable demand for shipbuilding shares, owing, it is thought, to the remarks of the chairman at the meeting of John Brown, Ltd., but the demand is on a market practically bare of stock. Among armament shares there is also a good tone, although the active demand for this group is not quite so insistent as formerly. Armstrongs are quoted ex the dividend at over 39s., and Vickers are a strong market at about the same figure.

SHIPPING, SHIPBUILDING, ENGINEERING AND MARINE INSURANCE SHARE LIST.

SHIPPING.

Name.	Share and paid.	Extreme quotations, 1916.	Last ann. div. % or per share.	Yield. %	Last Quotation	Rise or Fall.
	£					
African S.S.	20	33—23⅝	10	6¾	29	
Allan Line ... ... Deb.	100	—	4	4⅜	92	
Anchor Line ... Cum. pref.	10	9⅞—9¾	5⅜	5½	9¼	
Do. ... ... Deb.	Stk.	105⅛—102⅜	4⅜	4⅜	103	
Argentine Nav. ... Cum. pref.	1	19/6—11/-	Nil.	Nil.	23/-	— -/3
Do. ... ... Ord.	1	14/6—5/6	Nil.	Nil.	17/-	—1/3
Australasian Un. S. Nav. Deb.	Stk.	83⅜—80⅜	4	5	79	
Belfast Steam ... ... "A"	10 (5pd.)	—	5	5	5	
British & African Nav. Deb.	Stk.	96⅜—91	4⅜	4⅜	102	
British India Nav. ... Deb.	Stk.	94¼—88½	4⅜	5¼	83	
British S.S. Invest. Trust Def.	Stk.	357—190	30*	8⅜	350	
Do. ... ... Pref.	Stk.	108—105⅜	6	5¾	103	
Do. ... ... Deb.	Stk.	79—77⅜	4⅜	6⅛	74	
Cairn Line ... ... Deb.	Bds.	99—88	5	5⅛	90⅜-91	
Do. ... ... Ord.	1	—	20†	9⅛	44/4½	+2/4½
Clan Line ... ... Ord.	10	32½—22¼	25	8⅝	30	
Court Line ... ... Ord.	£1	42/—26/-	23	13⅛	34/6	+4/-
Cunard SS. ... ... Ord.	1	101/—68/-	20*	5¼	75/-	
Do. ... Cum. pref.	Stk.	95—89	5	5⅜	85½	
Do. ... ... Deb.	Stk.	99⅛—93¼	4⅜	4⅝	96	
Elder Line ... ... Deb.	Stk.	97¼—89⅜	4⅜	4⅜	103	
Elder Dempster ... Cum. pref.	1	20/6—18/1⅜	5⅜	5⅜	18/6	
Do. ... ... Deb.	Stk.	92⅜—88⅜	5	5⅝	86	
Ellerman Lines ... Pref. Ord.	10	9⅛—9¼	6¾	6⅞	8¾	
Do. ... Guar. pref.	10	9⅛—8¾	4⅜	5¼	8⅝	
France Fenwick ... Cum. pref.	5	98/5—92/6	5⅜	6¼	87/6	
Furness, Withy ... Ord.	1	61/3—34/3	20*	9⅛	49/-	+1/9
Do. ... Cum. pref.	10	9¼—7⅜	5	5⅛	9	
General Steam Nav. Ord.	7⅜	12⅜—8½	15	7⅜	22/6	
Do. ... ... Pref.	8	7⅛—6¾	6	7⅜	16/-	
Houlder Line ... Cum. pref.	5	83/9—67/6	5⅜	6⅞	80/-	
Do. ... ... Deb.	Stk.	—	4⅜	4¼	93	
Houlder Bros. ... Cum. pref.	5	—	5⅜	5⅜	4	
Do. ... ... Deb.	Stk.	—	4⅜	5⅜	82	
India Gen. Nav. & Rly. ... Ord.	10	12—8¾	6	5⅜	10⅜	
Indo-China N. ... Pref. Ord.	5	5 7/16—90/-	6	6¾	90/-	
Irrawaddy Flotilla	40	—	15	5 1/16	116	
Khedivial Mail ... ... Ord.	1	37/—10/-	25	13¾	35/1½	+4/7½
Do. ... ... Pref.	5	77/6—60/6	5⅜	7⅛	75/-	
Do. ... ... Deb.	Stk.	94¾—87¼	4⅜	4⅝	95	
King Line ... ... Ord.	1	—	16*	9⅜	37/-	
Lamport & Holt ... Cum. pref.	£1	20/9—18/9	6	6	19/6	
Leyland (F.) ... Cum. pref.	10	8⅛—6¼	5	6¾	7½	
Mercantile SS. ... ... Ord.	5	18⅝—12	40	13	15 3/16	+ 3/16
Do. ... ... Pref.	1	20/1½—20/-	5	6¾	15/-	
Moor Line ... ... Ord.	10	—	30	13½	22½	
Nelson Steam Nav. ... Deb.	100	98½—97⅜	5	5⅛	98¼	
New Zealand ... ... Ord.	£10	—	8	2½	32½	
Do. ... ... Deb.	Stk.	90⅜—88	4	4⅜	86	
Nitrate Producers SS. ... Ord.	5	25¾—18	30	6¼	24½	
Do. ... Cum. pref.	5	—	5	5	5	
Oceanic Steam. Nav. ... Deb.	100	99—95⅝	4⅜	4¾	96½	+ ½
Orient.Stm.Nav.Co. Cum. pref.	10	9⅛—9 1/16	5	5¼	9	
Do. ... ... Deb.	100	98—91⅜	4⅜	5⅛	89	
P. & O. S. N. ... Cum. pref.	100	100—91	5	5⅜	92	
Do. ... ... Def.	100	349—270	18	5⅝	318	—3
Do. ... ... Deb.	Stk.	71—69	3⅜	5⅜	63	
Prince Line	1	95/—26/-	30	7¼	87/6	+2/6
R.M.S.P. ... ... Ord.	100	134⅜—97½	7	6⅜	112	—1
Do. ... ... Pref.	Stk.	86¾—76⅜	5	6¼	81	
Do. ... ... Deb.	Stk.	89—86	4⅜	5⅜	79	
Shaw, Savill & Alb. Cum. pref.	5	95/—86/3	5¼	5¾	85/-	
Shell Transport ... ... Ord.	1	6—4⅛	35	5¼	5½	
Do. ... Cum. pref.	10	10⅛—9	5	5⅜	9⅜	
Sutherland SS. Co.	£1	69/6—41/6	30	10	52/-	
Union-Castle SS. Cum. pref.	10	7 1/16—7	4⅜	5	7½	
Do. ... ... Deb.	Stk.	92⅜—86⅜	4	4⅜	87½	
West Hartlepool ... ... Pref.	10	8¼—7⅝	5⅛	7⅜	7⅝	

INSURANCE.

Alliance	20 (2·4 pd.)	10¼—8¾	12/-	7	9 13/16
Indem. Mutual Marine	15 (3 pd.)	13⅜—9½	15/-	5	20½
London Assurance	25 (12½ pd.)	52½—42½	20	6	56xd
Marine Insurance	25 (15 pd.)	36¼—33⅜	45/-	6	56
Merchants' Marine Insurance ...	10 (2½ pd.)	7¼—71/3	10	6	9¾
N. British & Mercantile Ord.	25 (6¼ pd.)	34⅜—29	40/-	6⅜	34⅜
Phœnix Assurance	10 (1 pd.)	7⅜—5⅞	40	7	7⅛
Reliance Marine	10 (2 pd.)	—	20	4⅜	7¾
Royal Exchange Assurance ...	Stk.	189½—181	10	5½	225
Sea Insurance	10 (2 pd.)	19⅜—19⅛	10	6	27 9/16
World Marine, Limited ...	5 (2 pd.)	61/3—35/-	5	4⅜	6¼

IRON AND STEEL.

Name.	Share and paid.	Extreme quotations, 1916.	Last ann. div. % or per share.	Yield. %	Last Quotation	Rise or Fall.
	£					
Babcock & Wilcox... ... Ord.	1	64/6-47/10½	15	5	66/-	+1/-
Baldwins ... Cum. pref.	1	1⅛—1	5⅛	5⅜	20/-	
Do. ... ... Deb.	Stk.	87⅜—86¼	4⅜	5⅛	84	
Bayliss, Jones ... Cum. pref.	1	—	5	7½	1 1/16	
Bell Bros. ... ... Cum. pref.	10	10 5/16—9 3/8	6	6½	9¾	
Do. ... ... Deb.	Stk.	80—78⅜	5	6⅜	75⅜	
Bessemer (Henry) ... Ord.	1	29/—26/-	12⅛	8½	29/9	
Bolckow Vaughan ... Ord.	1	25/10⅜-18/-	11	8	27/-xd	
Do. ... ... Cum. pref.	20	19—18	5	5⅞	16	
Cargo Fleet Iron ... ... Ord.	1	23/3-13/10⅜	3	3⅜	23/1½	+ -/1⅛
Do. ... ... Deb.	100	86¼—84	4⅜	5⅛	82	
Consett Iron Co. ... ... Ord.	1	89/4½--65/3	50	11⅛	90/-	
Dominion Iron & Steel	Bds.	83—78	5	6⅜	78	
Dorman, Long ... ... Ord.	1	36/—22/3	14	9	40/-	
Do. ... ... Deb.	Stk.	97⅜—97	4	5½	73	
Ebbw Vale Steel & Iron Ord.	1	28/7½—19/-	12⅛	9½	28/1⅛	— -/4½
Guest, Keen & Nttefids Ord.	1	71/3—60/-	15*	3¾	81/-	+5/-
Do. ... ... Cum. pref.	5	5⅛—5⅛	5	4⅝	5⅛ xd	
Do. ... ... Deb.	Stk.	82⅞—80⅜	4	5¼	79⅛	
Hadfield's Steel Foundry Ord.	1	82/6—69/-	30	6	100/-	
Ibbotson Bros.	5 (4 pd.)	8—6	7⅛	4½	6¼	
Jessop (W.) & Sons ... Ord.	5 (4 pd.)	9—8	15*	7¼	9	
Lanarkshire Steel Cum. pref.	10	—	5	7⅛	7	
Lysaght (J.) ... Cum. pref.	1	22/7⅛—20/3	6	6	20/-	
Do. ... ... 2nd pref.	1	21/1⅜—21/-	6	6	20/-	
Manganese Bronze ... Ord.	1	—	6	11	⅛	
Do. ... ... Cum. pref.	1	—	6	8	⅜	
North-Eastern Steel ... Deb.	Stk.	—	4⅜	—	—	
Palmers Ship & Iron "A" ...	1	12/6—9/-	Nil.	Nil.	10/9	
Scott (Walter) ... ... Ord.	1	26/3—17/9	15	12	25/-	
Do. ... ... Pref.	1	16/10⅜-16/3	6	7⅜	16/3	
Sheffield Forge ... ... Ord.	1	—	15	7½	69/-	
Shelton Iron & Steel ... Ord.	1	20/4⅛—15/-	7⅜	8¼	21/-	
Do ... ... Deb.	100	94—92⅜	5	5½	91⅜	
S. Durham Steel & Iron Ord.	1	37/6—27/-	10	6⅜	36/-	
Do. ... ... Cum. pref.	1	21/—19/-	6	6⅛	20/-	
Do. ... ... Deb.	Stk.	82—80	4⅜	5⅜	80	
Steel Co. of Scotland ... Ord.	10	—	10	10	12/1/-	
Stewarts & Lloyds Pref. ord.	10	18⅛—17	10	6¼	16	
Do. ... ... Cum. pref.	10	—	6	4⅝	13⅛	
Stone (J.) ... ... Cum. pref.	10	—	5	6½	8	
United States Steel ... Ord.	100$	144¾—83¾	8	6¼	116xd†	
Do. ... ... Cum. pref.	100$	128⅛—112¾	7	5⅝	122¼xd†	
Vickers Ltd. ... ... Ord.	1	40/3—33/6	12⅛	6⅜	38/6	—1/-
Do. ... ... Pref.	Stk.	93—85	5	6	84	
Do. ... ... Deb.	Stk.	83—75	4	5 3/16	79	+1
Weardale Steel ... Def. ord.	1	34/—19/1⅜	19⅛	13⅜	29/-	
Do. ... ... Cum. pref.	1	23/6—17/6	6	5	24/6	
Do. ... ... Deb.	Stk.	70⅜—69¼	4	6	63	
Workington Iron & Steel Ord.	1	24/3—14/3	10	7⅜	26/3	+ -/3

SHIPBUILDING AND MARINE ENGINEERING.

Armstrong, Whitworth Ord.	1	43/—34/6	12½	7	40/6	
Do. ... ... Cum. pref.	5	75/—67/6	4	5¾	70/-	
Do. ... ... Deb.	Stk.	80¼—75	5	6⅜	76	
Beardmore (W.) ... ... Deb.	100	99—92	4⅜	5	91	
Brown (John) ... ... Ord.	1 (15s. pd.)	27/3—20/6	12⅜	8⅛	26/6	
Do. ... ... Cum. pref.	10	10—5⅜	5	5¾	8¾	
Cammell Laird ... ... Ord.	5	7—98/-	10	8	7⅛	
Do. ... ... Cum. pref.	5	88/—76/3	5	6⅜	85/-	
Do. ... ... Deb.	100	93⅜—85	4⅜	5⅜	81	
Dunlop (Jas.) ... ... Ord.	1	19/7⅛-13/4⅜	10	10⅜	19/-	
Do. ... ... Cum. pref.	1	17/1⅜-16/4⅜	6	7⅜	17/6	
Fairfield Shipbldg Cum. pref.	10	8⅜—8 1/16	6	7⅜	8⅜	
Fleming & Ferguson ... Ord.	10	—	10	7	14½	
Gray (Wm.) ... ... Deb.	100	100⅛—99¾	4⅜	4⅜	100¾	
Hawthorn (R. & W.) Leslie Ord.	10	15⅜—14	12⅜	5⅜	23	
Henderson (D. & W.) Cum. pref.	1	—	5	8⅞	7 5/8	
Richardsons Westgarth Ord.	1	7/9—2/10⅜	Nil.	Nil.	6/6	
Do. ... ... Cum. pref.	1	15/7⅜—8/-	Nil.	Nil.	16/9	
Do. ... ... Deb.	Stk.	69—67⅜	4⅜	6⅜	65	
Simons (W.) ... Cum. pref.	10	—	5	5	9 1/16	
Swan, Hunter & W. R. ... Ord.	1	35/6—26/-	12⅜	6½	41/6	
Do. ... ... Cum. pref.	1	18/9—17/-	5	5¼	17/-	
Do. ... ... Deb.	Stk.	82—80⅜	4½	5⅜	78	
Thornycroft (John I.) ... Ord.	1	38/9—21/9	17⅜	9½	38/4½	+1/3
Do. ... ... Cum. pref	1	18/6—16/3	6	6⅜	17/6	— -/6
Do. ... ... Deb.	100	95⅜—88	5	5⅝	84	
Wallsend Slipway ... Ord.	1	2—1⅛	10	5	2	
Do. ... ... Cum. pref.	1	1—1	5	5	1	

* Including bonus. † Also 20 % in shares. ‡ Treasury price.

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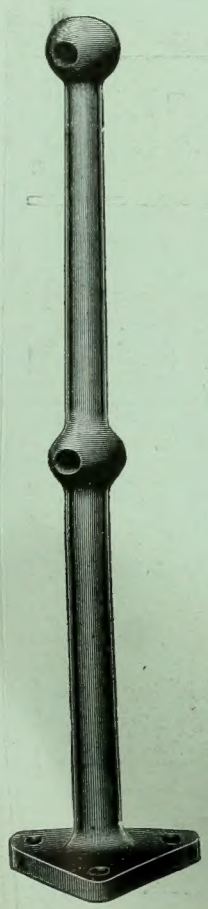

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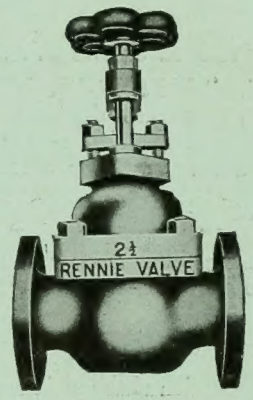

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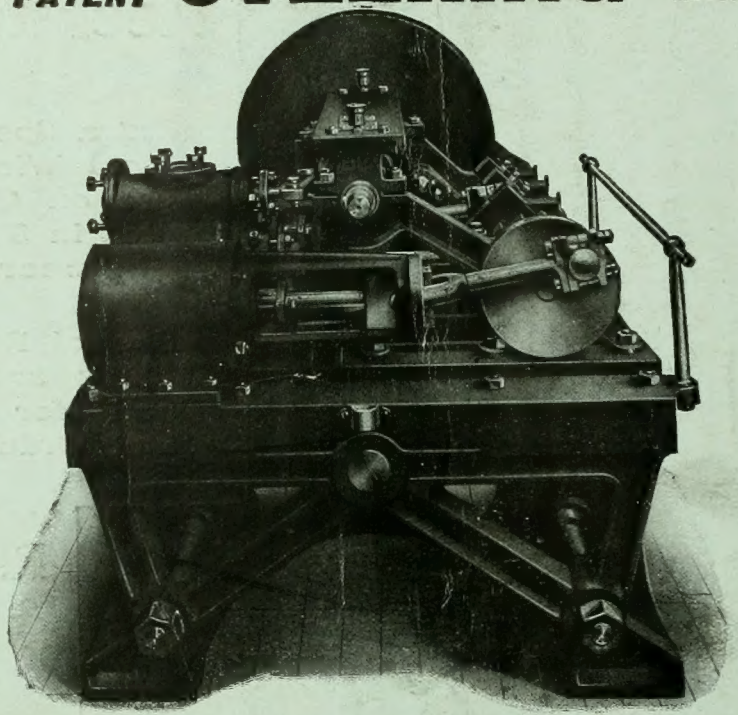

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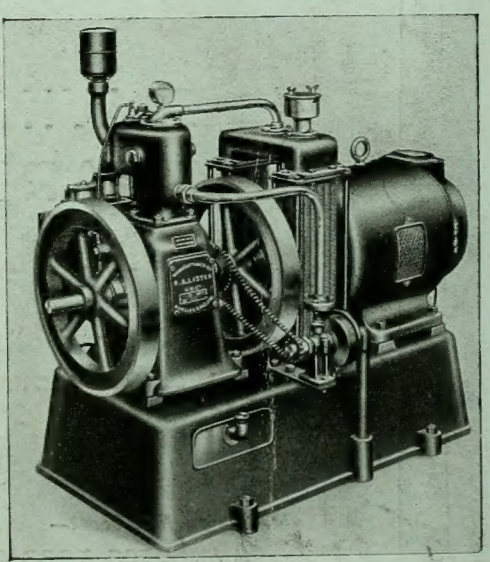

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